FARMERS DIGEST

FEB 24 1939
U. S. Department of Agriculture

MARCH, 1939

Volume 2
Number 11

25c a Copy
$2.00 a Year

Chemical Soil Fumigation	*Seed World*	1
Big Returns from Little Forests	*American Forests*	6
Fighting Stem Rust	*Missouri Ruralist*	8
Preventing Coccidiosis	*Everybodys Poultry Magazine*	10
Control of Termites	*Cimco Fortnightly*	14
Seed Treatment is Good Insurance	*American Agriculturist*	18
Pigeon Racing as a Sport	*Rural New-Yorker*	20
Growing Plants Without Soil	*Texas Farming and Citriculture*	23
Developing Pastures in Florida	*Jersey Bulletin*	28
High Quality Roughage	*Successful Farming*	30
New Methods for Tomato Growers	*Better Crops*	35
High Quality Alfalfa	*Farm and Ranch*	39
Peach Orchard Development	*American Fruit Grower*	40
Prolapse and Pickouts	*American Poultry Journal*	45
Fertilizers for Soybeans	*Southern Planter*	48
Getting the Most Out of Nitrogen	*California Cultivator*	52
Baby Capons	*Poultry Item*	55
Milk in Gallon Jugs	*Holstein World*	57
Trade Barriers Between States	*Market Growers Journal*	59
Improved Methods of Sampling Milk	*Farm Research*	62
Geese as a Sideline	*New England Homestead*	65
Hybrid Grain Sorghum	*Capper's Farmer*	67
Cleaning Gutters No Chore	*Ohio Farmer*	69
Methods Employed in Swine Breeding	*Poland China Journal*	71
Cream Separators Needed	*The Farmer*	78
Growing Grass for Seed	*Kansas Farmer*	79
Square Shoulders in Seed Corn	*Indiana Farmers Guide*	82
Transplanting Trees When in Leaf		85

The Farmer's Digest

From more than two hundred magazines and bulletins published in this country and abroad, the Editorial Staff of the Farmer's Digest selects articles of outstanding merit and general interest. It is comprehensive in its scope, covering all phases of Agriculture.

The Farmer's Digest

Published monthly at Ambler, Pennsylvania

25c a Copy *1 Year $2.00*

2 Years $3.50 *3 Years $5.00*

Foreign Subscription $3.00 a Year

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Entered as second-class matter at the Post Office at Ambler, Pa., May 5, 1937, under act of March 3, 1879

The Farmer's Digest

Vol. 2 March, 1939 No. 11

Chemical Soil Fumigation for More Luxurious Growth

Condensed from Seed World

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and
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INSUFFICIENT thought has been given to the destructive effects which certain soil micro-organisms have on plants. Tests have proved that these organisms, as well as the chemical depletion of the soil, are responsible for the practice of crop rotation. Planting the same crop in the same location each year has a tendency to accumulate a more numerous population of micro-organisms which adversely affect the particular crop, and after several years these organisms become so abundant as to cause a degree of injury which the plant can not very well overcome. Also, there has long been a need for a volatile chemical which can be used to rid the soil of disease organisms, noxious weeds, and weed seeds. In view of these facts, many experiments have been carried on at the Rhode Island Agricultural Experiment Station involving the fumigation of soil by means of chloropicrin.

Some of the first tests have dealt with the effectiveness of chloropicrin for partial soil sterilization and the subsequent effect on the growth and yield of field crops. For each of these tests two areas were chosen, having similar conditions. One section was treated and the other was left untreated for comparison with the treated area. Among the crops first tested were peppers, tomatoes and eggplants. Areas were treated with chloropicrin in crowbar holes 15 inches apart at the rate of 201, 217 and 369

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pounds per acre, respectively. The results were surprising. The peppers produced 204 per cent, the tomatoes 146 per cent, and the eggplants 306 per cent as compared to the marketable fruit produced on an equal area of untreated soil. This amounted to a per acre increase of 755 bushels, which at 40c per bushel gave an additional $302, for the peppers; an increase of 315 bushels, which at $1 per bushel gave an additional $315, for the tomatoes; and an increase of 372 bushels, which at $1 per bushel gave an additional $372, for the eggplants. These figures represent an average of duplicate plots.

The roots of the tomato plants in the untreated soil at the time of harvest were poorly developed and exhibited many brown apical and lateral necrotic lesions, while the roots of those from the sterilized soil were very profuse and healthy. Tomatoes had been grown the previous season in this soil.

In the eggplant plot, where the same crop the previous year had been a total failure due to "Wilt" and "Phomopsis Blight," the plot receiving chloropicrin applications showed no plants dead of "Wilt," and in addition, Phomopsis leaf infection appeared later and much less severely than in the untreated plots.

In one crop rotation experiment the land has been used for the same sequence of crops since 1907, namely: potato, mangels, carrot and onion, rotating with onions, potatoes, mangels, rutabagas, cabbage, millet and carrots, in an attempt to explain why some crops depress the growth of certain crops that follow. After 40 years, chemical and other soil tests have not given a complete satisfactory explanation. A study of the role of soil-harbored organisms is now being undertaken. In 1937, the westerly part of each one-fifteenth acre plot was fumigated by injecting chloropicrin into the soil in crowbar holes 15 inches apart at the rate of 154 pounds per acre. Alcohol was used as a diluent for ease of application. The easterly portion of each plot was not fumigated. The treated areas were not covered to prevent escape of the gas. The figures in accompanying table give a summary of the comparative crop yields.

It will be noted in the table that onions gave an average increase in yield of 43 per cent, cabbage 22 per cent, millet 46 per cent, carrots 52 per cent, mangels 65 per cent, and rutabages 88 per cent. For example, in the case of carrots the increase amounted to 225 bushels per acre, giving the grower an additional net income of $71 per acre over the cost of the chloropicrin figured at one dollar per pound.

The foliage of mangels, rutabages, carrots, and cabbage growing in chloropicrin fumigated soil was practically free of their respective commonly occurring leaf spots, while on untreated areas as high as 85 per cent infection was found. Another example of disease control was in the cabbage plots, where 23 per cent of the plants in the untreated soil had "Club Root," while not a single plant in the treated soil was infected.

Weed Control

In many agricultural practices it is often desirable to have soil which is free from viable weed seeds. To obtain this condition has always proved laborious and expensive. At the Rhode Island Agricultural Experiment Station sterilization of soil for the purpose of top dressing the grass plots has been done with steam and with electricity. Also, in a search for even better methods, work is being done involving the use of chemicals. As a result a method has been evolved whereby liquid chloropicrin is injected into the soil. This chemical vaporizes readily to kill both living weeds and moist seeds which are always abundant in compost soils. Two years' experience at treating compost soil mixtures has resulted in a chloropicrin treatment that is practical as well as labor-saving and relatively inexpensive to use. The dosage used in most cases is 8 to 10 cc. per cubic foot of soil, but under optimum conditions it seems that lower dosages may be equally effective. After treatment the soil was covered and allowed to stand for three days. At the end of this period the covers were removed and the gas given a chance to escape. The soil is screened and ready for use for top-dressing turf or other purposes about ten days after treatment.

Many factors have been found to play an important part in the effective use of chloropicrin. The success in using it as well as the dosage required has been found to be dependent upon the following conditions:

1—*Moisture.* It has been observed that the moisture content of the weed seed at the time of treatment is very important. The higher the moisture content of the seed the more easily they are killed by chloropicrin vapor. Therefore it seems desirable to wet the soil several days prior to treatment and to allow it to dry somewhat before treatment. At the time of treatment the moisture content should probably be about 50-60 per cent of the water holding capacity of the soil, since the presence of moisture also helps to hold the vapor. After covers are removed, the soil should be allowed to dry so that the vapors will leave the soil as rapidly as possible.

2—*Temperature.* This has proved to be also very important and unless the soil temperature is 65 deg. F. or above the results are likely to be poor. With an increase in temperature the effectiveness of the gas rises very rapidly and consequently lower dosages can be used. Therefore, it is desirable to obtain as high a soil temperature as possible. Because of this factor, a practice is being made of treating sufficient soil during the warmer summer months to last throughout the year.

3—*Type of Soil.* A sandy soil will lend itself to this type of sterilization better than a heavy soil because the vapors can penetrate to all parts more readily. Also, in order to obtain better dispersion of the gas, it seems advisable though not necessary, to screen the soil before treatment.

4—*Type of Weeds.* The susceptibility of the weeds and the weed seeds to chloropicrin varies. For example, Cornspurry *(Spergula arvensis L.)* is killed by very low dosages, whereas Lambs' Quarters *(Chenopodium album L.)* required larger dosages. The dosages, which are given here, were sufficient to kill all of the various types present. However, it is possible that in some sections a particular species of weed may be found which would require larger dosages.

5—*Confinement of the Vapor.* Since the weed seed must be exposed to a lethal concentration of the vapor over a certain period of time in order to be killed, the longer the concentration of the gas can be held in contact with the seed, the more effective the kill. Thus, the type of box used to hold the soil is important. From the work it seems that a box 4 feet by 3 feet by 27 inches is very satisfactory both from a standpoint of ease in treating and in handling the soil. Twelve injections of 10 cc. each are made at both 21-inch depth and at 8-inch depth. Thus 240 cc. of chloropicrin are used to sterilize a cubic yard of soil. The box should be as nearly gas tight as possible and have a cover which can be firmly fastened down to prevent the escape of the gas. In order to save labor in removing the soil the side of the box may be constructed so that it can be removed.

A simpler method that may be used is to mix a quantity of compost soil and sand into a pile 4 feet by 3 feet by 27 inches and treat as before. After treatment a chloropicrin vapor-impervious cloth cover 9 feet by 10 feet is placed over the pile and the edges of the cover buried in the ground, thereby preventing the escape of the vapors. Thus a method of sterilizing soil is being developed at the Rhode Island

Agricultural Experiment Station which compares very favorably with steam and electricity and has several distinct advantages, namely:—(1) little initial expenditure is necessary for equipment, (2) the actual treatment is relatively simple, (3) the treatment kills injurious soil organisms as well as weed seeds, (4) the mechanical or physical condition of the soil is not altered, and (5) if the soil is used for potting soil, a distinct stimulation of subsequent plant growth results from the treatment.

Factors which may handicap its use may be listed as follows: —(1) there is an interval of about ten days necessary between the time of treatment and the time of using, and (2) in many cases it may be inconvenient to obtain the desirable soil temperature, because if large quantities of chloropicrin are used inside the vapors are toxic to plants and uncomfortable to humans. It may be stated that this method of soil treatment is worthy of serious consideration and thorough trial by those not already possessing satisfactory equipment for the sterilization of soil.

SUMMARY OF YIELDS FROM CHLOROPICRIN TREATED AND UNTREATED FIELD SOILS

Crop	Units	Yield from Treated Soil	Yield from Untreated Soil	Increase	Per Cent
Cabbage	bbls./acre	198	163	35	22
Carrots	bu./acre	652	427	225	52
Mangels	tons/acre	15.3	9.3	6.0	65
Millet	tons/acre	11.1	7.6	3.5	46
Rutabagas	bu./acre	710	378	332	88
Onions	bu./acre	179	125	54	43
Tomatoes	bu./acre	1,002	687	315	46
Peppers	bu./acre	1,482	727	755	104
Eggplants	bu./acre	552	180	372	206

Big Returns from Little Forests

Condensed from American Forests

Nelson C. Brown

SOMETHING unusual in the United States, though commonly found in some of the European countries, is a small forest yielding sufficient income to maintain a family and several employees for hundreds of years. And this forest may consist of a tract of only 1,250 acres, or less than two square miles, as is the case of the family forest of Perfall, in Bavaria.

While it is true that many large family estates have been in existence in Germany for several hundred years, and have been conducted profitably, the forest of Perfall is an example of a small area intensively managed in such a way that the forest is kept continually growing although there is a constant cutting. The secret of success has been to develop a local market for every possible product of the forest. And this business of handling the forest as any private business or enterprise has been handed down from father to son since the year 1230. The seat of the forest of Perfall is on a high hill near the ancient village of Greifenberg. Here is located the old family castle from which one may enjoy a magnificent view of the Bavarian Alps, looming high with snow-capped peaks to the south. Barons and other nobles erected their castles on high hills principally for defense against roving bands of marauders, or in times of war. A little chapel for family worship is still used, and an old moat is still maintained in good condition. The placid waters of a lake are close by, and well kept farms and forests are maintained in the neighborhood much as they have been for centuries.

This little family forest is composed almost entirely of Norway spruce, with some beech, and it is growing timber at the rate of 750 board feet a year an acre—an unusually high rate compared with average American growing conditions. Since 1840, a very carefully prepared management plan has been followed. Trees are cut when ninety-two years old and the stands are constantly thinned during the growing period in five distinct age classes. A little beech is permitted to grow one hundred and forty years before being cut.

The secret of financial success in this forest management plan is a small sawmill used to cut from 6,000 to 8,000 board feet a day to supply a local demand for various forms of building operations. At 6,000 board feet a day

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output, this little sawmill runs an average of 110 days a year.

In addition to the principal lumber product which is cut at the sawmill on the property, a yearly return of about $2,800 is secured from miscellaneous by-products of the forest—the faggots and small thinnings used for fuel wood, sawdust for bedding, grazing privileges sold to the local farmers for their cattle, gravel pits, wild berries and mushrooms. In fact, the by-products from these miscellaneous materials produce a larger net income than does the sale of lumber. Advantage is always taken of changes in local market conditions so that the standing timber is converted into such materials as hayracks, ladders and fence posts.

Each year, in addition to these by-products, about 840,000 board feet of lumber are cut. At $50 a thousand feet, this would yield a gross income of $42,000 out of which must be paid expenses for logging, log haul, manufacture and sale of lumber.

From game is also derived an important by-product in this plan of forest management. Each year from thirty to forty roe-buck are taken in the forest, as well as from fifty to seventy hare. In addition, fishing privileges on a small trout stream are rented at from $160 to $200 a year.

This little forest business keeps six men engaged continuously. The same crew that does the logging operates the sawmill. The son of the family is chief forester and general manager. He is kept busy looking after cutting and sawmill operations and deliveries. He must also sell the lumber and other products.

The general manager studies the local market requirements and carefully changes his cutting and sawing policies to meet the need. Slab wood and fuel wood are sold at an equivalent price of $12 a thousand board feet. The spruce lumber sells on an average of about $55.50 a thousand board feet. Most of it is cut into twenty-four millimeters in thickness, which is slightly less than our inch lumber.

The only income of this family has been derived from the production, manufacture, and sale of forest products from this comparatively small forest—a forest about the size of many farm woodlots and similar small timber tracts in the eastern and southern United States. It may be that in the future we in this country can expect to do the same things. Timber products are worth more in Europe than in this country, it is true, but the chances are that economic conditions will change so that our forests will ultimately become of much greater value than at present.

How We Can Fight Stem Rust

Condensed from The Missouri Ruralist

J. Carl Dawson
State Entomologist

and

George M. Frandsen
State Leader of Barberry Eradication in Missouri

THE destructive black stem rust disease of wheat, barley, rye, and many native grasses, probably caused more damage to the Missouri wheat crop last year than ever before. A logical question is, "Why was there so much rust?"

In Mexico and Southern Texas, stem rust lives the year around in the summer, or repeating stage, sometimes wintering over as far north as Northern Texas and Oklahoma. Early last spring, rust spores, seed of the rust, were carried northward into Missouri by the wind, and there found conditions favorable to rapid growth and multiplication. This early start led to extensive damage before the crops matured.

Stem rust is caused by a minute parasitic plant which thrives under conditions that are particularly favorable to the development of most other forms of plant life. The conditions that made the epidemic possible last year were: An early and widespread distribution of rust spores both from local barberry bushes and from rusted grain fields farther south, also warm weather, plenty of moisture, high humidity, and a large acreage of wheat. Some of this wheat was of varieties extremely susceptible to the particular forms of rust present. Oats, barley and rye escaped with little rust injury, altho growing under the same conditions which caused severe damage to wheat, indicating that the varieties of stem rust to which these crops are susceptible were not present in any quantity in the South last year.

As already indicated, there are two important sources of stem rust, common barberry bushes which serve as the spring host for the fungus in Missouri and states farther north, and infected grains and grasses in the South which, under conditions such as existed last year, may serve as a source of infection for grain crops in Missouri. Last year stem rust spores were blown into Missouri from the South early enough in

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the season to allow the disease to become epidemic and result in extensive damage before the crops matured.

What can be done to prevent the recurrence of such extensive damage as occurred last year? There are several avenues for attacking the stem rust problem, all of which must be carefully considered if the best results are to be realized: (1) All susceptible species of barberry should be destroyed, thus eliminating a local and early spring source of stem rust spores; (2) varieties of grain known to be resistant to stem rust should be used for seed; (3) plant early-maturing varieties of grain that otherwise are adapted to your locality; and, (4) plant spring grains early on well-prepared soil. Fields of grain that mature early seldom are damaged from rust as much as the later crops.

There are about 150 forms of stem rust which attack wheat. Certain varieties may be highly resistant to some, and very susceptible to others. New forms of the fungus occur every year as a result of known strains hybridizing on the leaves of barberry bushes. The new hybrid races may attack varieties of grain highly resistant to both the parent races.

Treating Cold Frames for Fungus

TOMATO growers and others who are planning on growing young vegetable or flower plants in cold frames will be interested in recommendations made by Dr. J. B. Kendrick, associate plant pathologist of the University of California, relative to the treatment of soils in cold frames for the control of fungus diseases.

Dr. Kendrick recommends as follows: Soak the ground with formaldehyde, using 1 to 50 parts of water, one-half gallon per square foot, to well pulverized soil. This then should be covered for a period of 24 hours with burlap, canvas or other such material. The soil should then be allowed to dry and if possible, spaded up to facilitate drying. No seed or plants should be put in this soil for a period of at least ten days after the treatment. It is also important to wet the frames thoroughly around the seed beds.

Preventing Coccidiosis

Condensed from Everybodys Poultry Magazine

W. C. Tully
Virginia Polytechnic Institute

COCCIDIOSIS is a serious, highly infectious, protozoon disease which costs American poultrymen millions of dollars every year. The disease is caused by coccidia which are only one kind of a very great number of protozoa or single celled animals. Most readers are familiar with bacteria, which are single-celled plants. Many of these cause disease, while some are beneficial. Protozoa are animals, but similar in that they have only the one cell which is a complete living body in itself. Coccidia are microscopic in size.

An accurate knowledge of how to combat coccidiosis is important to all poultrymen, because there are but few who will not have some experience with the disease. This, together with the fact that the trouble causes such destructive losses, makes it perhaps the worst with which we have to deal.

Coccidiosis is not confined to chickens, other poultry as well as rats, foxes, rabbits, and calves, all have their one or more species of coccidia which are usually specific for the animal—that is for example, the coccidia attacking chickens nearly always will have no effect on other hosts. There are six recognized species of coccidia which attack chickens, but four of these, as a rule, produce only milder types of chronic intestinal inflammation. The other two do by far the most harm and are more common, resulting in coccidiosis appearing in two distinct forms.

The first of these is the acute form where chicks become sick and die quite suddenly. The second is the chronic form in which chicks become pale, very thin, crowheaded—and these often do not die for several weeks.

The external symptoms of coccidiosis are also of two kinds. The first is known as the bloody type and causes mortality often as high as 50 per cent of the flock if not checked in time. The affected chicks get pale in the face very rapidly and later may lose most or all of the yellow color in their shanks. They stand humped up with their wings drooping and often appear half asleep. They

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try to get near the source of heat. The characteristic symptom of this type of coccidiosis is bloody droppings or less frequently droppings of chocolate brown color.

The second type of coccidiosis shows somewhat similar external symptoms except that the droppings are very watery and yellowish. Chicks' feathers become ruffled and matted together around the vent. The litter becomes very wet.

Internal symptoms of coccidiosis shown on post-mortem examination are largely confined to the intestinal tract. Depending on the type of coccidia involved the intestinal lining in different parts will show a very decided enteritis (a decided red color and inflammation due to minute hemorrhages). In the common type of coccidiosis the caeca (bind guts attached to the intestine near the vent) will be enlarged or swollen and filled with bloody material.

Like some other diseases, when a chick gets coccidiosis, either it dies, or it apparently recovers but becomes a carrier of the trouble. These adult carriers may appear normal, but are still capable of infecting young chicks through contact, or by the medium of infected droppings from the hens being carried on the shoes, or by other means, to the young stock. This is only one reason why it is so extremely important to grow young chicks on clean green range (unused by any poultry for at least a year) and away from adult birds.

The complete life history of coccidia is very complicated. The spore or cyst is passed in the droppings of infected birds. These spores may be carried to the chicks from carrier hens. This cyst developes *outside* the chick in from 18 to 30 hours but only if warm moist conditions are present. This infective or spore containing stage is picked up by other chicks. It takes about five days for further development *inside* the chicken during which time thousands of organisms may develop from a single infective spore. Then comes the period of sickness when chicks are very droopy, pass bloody droppings, and many deaths occur. The surviving chicks, if not reinfected begin to recover in three to four days.

Coccidia live in a dormant or spore stage in the soil of poultry yards, in contaminated litter, and in dirty houses, where they may stay from one season to the next. Most cases of coccidiosis get a start either by allowing chicks in infested yards and houses, or by allowing chicks and carrier hens together. Mechanical and usually unknowing transfer of spores too often causes trouble. Plans which will be a definite help in preventing an outbreak of this very serious trouble follow:

1. Clean the brooder house at least every five days; this will keep down too great an accumulation of infective spores. If an outbreak occurs, clean the brooder house daily. Be sure that the house has been thoroughly cleaned and scrubbed with lye water before it is used. Strong lye water will not kill coccidia spores but will be a big help in thoroughly cleaning the house of much dirt which might contain spores.

2. Many poultrymen have found the use of a wire sunporch outside the brooder house an effective way to reduce losses. Half inch mesh, heavy wire—16 gauge —may be used for chicks up to five weeks or six weeks. Do not use a lighter wire as it won't last; too many poultrymen buy it because of the low first cost. It is better to use ¾-inch mesh wire because chicks do not soil this for the first eight weeks, as droppings pass through more readily. Then chicks are usually taken to range. If the brooder house cannot be moved, a wire sunporch is almost essential.

3. Keep the brooder house dry. Coccidia spores develop best in warm moist conditions. Leaky roofs must be repaired and after a driving rain, if the brooder house floor is wet, it must be cleaned immediately.

4. Construct water fountain platforms to prevent chicks getting at spilled dirty water or wet soiled litter on the floor around the fountain. Definite experiments have shown that coccidia develop best in the litter around the water fountains because it is damp, and where droppings accumulate quickest. Both water and feed hopper platforms may be built up on 1 by 4 or 2 by 4 frames on edge, using half inch hardware cloth for the floors. For permanent platforms provide support for the wire floor every foot.

The common type of coccidiosis can be accurately diagnosed by watching carefully for bloody droppings. This is the only disease with this symptom. If an outbreak occurs, or even if it is suspected, get busy. Do not wait even to have the disease definitely diagnosed as coccidiosis. While waiting for a diagnosis very often the disease can be stopped. Kill and burn the few affected chicks. They will die anyway, or become carriers of the disease and never amount to anything.

Thoroughly cleaning the brooder house at once will remove the immediate source of the infection. Clean the house daily for eight or ten days, or until all signs of the disease have disappeared. If the chicks have been on the ground, move the house immediately to clean range. Be certain that chicks cannot contaminate their own feed and water. Deaths will be increased by handling the

chicks. Keep sick chicks as quiet as possible and keep them warm. Proper brooding temperatures should be supplied for young chicks; if chicks have passed the stage of brooder heat, start the brooder stove again to supply adequate warmth. Provide a proper ration. The idea of starving chicks to control coccidiosis is wrong. Sick chicks eat little enough anyway.

Do not keep any pullets which have had a serious attack of the disease. They grow much more slowly, and experiments at the Louisiana Agricultural Experiment Station have shown that pullets matured 6½ weeks later than unattacked birds and laid only half as many eggs. The effects of a severe case of coccidiosis are, therefore, permanent and birds can probably never be profitable.

Useless Bacterins

ARE the millions of doses of bacterins sold annually for the cure and prevention of poultry diseases worth the money which is poured into them? "No!" thundered pullorum-disease laboratory workers at their recent annual conference, and immediately formulated a resolution which was sent to the American Veterinary Medical Association, the United States Livestock Sanitary Association, and the U. S. D. A.

"There is no experimental evidence that such bacterins have preventative or curative value for any known poultry disease," said the laboratory workers in their resolution, "and the use of such bacterins imposes an unnecessary expense on the cost of poultry production." Other objections raised were that reliance in the bacterins prevents or delays the adoption of known sanitary measures, that production may be lowered, and that infectious diseases already present in the flock may be spread still further.

—*Successful Farming*

Control of Termites

Condensed from Cimco Fortnightly

TERMITES are not new in this country. There is evidence that they were here when Indians roamed the prairies. Then, however, they lived in their native habitat, the woodlands. Feeding on the abundant supply of dead wood, they bothered no one. Damage from termites is a direct result of civilization because when woodlands were cleared and man built wooden structures, the termites, without natural food, turned to the wooden building. When man installed heating plants and kept the building warm the year round, he provided a condition wherein the termites, once established, enjoyed summer comfort the year around and thus increased greatly the scope of their activities.

Like ants and honey bees, termites are social insects and live in great colonies with kings, queens, workers and soldiers. The destructive group are the workers which appear as soft, dirty, white maggots with legs. This group of workers cannot reproduce. During February, in heated houses and as late as June where natural temperatures prevail, swarms of black winged individuals may emerge from the colonies. These are the reproductive form and are capable of starting new colonies. Often, the swarming of these reproductive termites is the first indication one has that termites are present. This form of termite can be distinguished from the harmless winged ants by the fact that their bodies are almost uniform in width whereas the winged ant narrows sharply between the fore and hind parts. Also the wings of the termite are nearly twice as long as the hind portion of the body. The wings of the winged ant are very little if any longer than the hind portion of its body.

Each mating pair of the winged termites or "swarmers" is capable of starting a new colony. Most of them fall prey to birds, toads or other natural enemies. Some fail to find suitable nest sites and perish; but a few fortunate pairs locate suitable nesting places and dig a little cell, after breaking off their wings. Mating follows and soon after the female or queen begins to lay eggs. Relatively few eggs are laid the first year; but after the first year reproduction gains momentum and when the colony is three years old thousands of termites are being produced annually. Some of these are

the winged form which swarm and fly away to start other colonies.

There are also wingless termites capable of reproducing so that even though the king or queen is destroyed, the reproductive power of the colony is not much impaired. These wingless reproductive termites may also crawl a short distance away and establish new colonies so that there is within a few years a community of termite colonies.

Progeny of the wingless reproductives never have wings so it is possible for a building to be termite infested without a swarm of winged reproductives ever appearing on the surface. Also, it is not uncommon for an old established colony to cease sending out swarmers because of the loss of its original queen. This may lead to the belief that the building is free from termites because swarming has ceased; yet termite infestation may still be present. It is a good practice to destroy the swarming termites as this controls their spread; but this does not reduce the power of the original colony to damage property.

The natural habitat of termite colonies is in the soil. The soft bodied termite workers are not able to withstand the drying effect of the atmosphere, hence, they never occur in the open. However, they build elaborate tubes and galleries which they use as passageways. They practically always feed on wooden material in such a way that the exterior is left intact. Thus serious damage often occurs without any external evidence of termite activity. It is important to know tell-tale signs of their presence and semi-annual inspection should be made of susceptible buildings to guard against serious damage.

Examination of wood which rests on or near the ground may reveal the workers. Unpainted yellow pine stakes may be driven in the ground about a building to check the presence of termites. If the insects are abundant in the vicinity, they will attack the stakes within a period of about sixty days. Although termites may occur in the soil about a building without infesting the structure itself, if they are found close to a building, the owner should be alert for signs of their attack.

Wood which is near the ground, as that in cellar window frames, steps, lattices or supporting timbers, may be checked for soundness by being tapped and probed with an ice pick. If the wood is found hollow, termites may be suspected.

Where wood that does not rest on the ground has been attacked by termites, brown shelter tubes may be found connecting the

wood with the soil. These may be found over foundations or other walls, either inside or outside, over masonry, piers and sometimes on the surface of the wood itself.

Besides the above signs of termite activity, the occurrence of a swarm, as already discussed, is evidence that a colony is present. It should be remembered, however, that termites may exist without swarming.

It is sometimes difficult to locate termite damage especially where foundations are poor and tubes can be built up through the inside of the foundations where they are not visible to an inspection. Termites favor the inside surfaces of foundations for building their passage tubes so these should be accessible for inspection.

Whether termites are inflicting damage or not, one should constantly be on the alert to forestall a possible attack. The finding of termites need not be the cause of great fear and alarm; but definite steps should be taken to eliminate them as soon as discovered. Expensive and difficult repairs are sure to result if the termites work undisturbed over a long period.

In severe cases of long infestation there is nothing to do but replace, structurally, the damaged parts and clean up the premises of the live insects. Where the damage is insignificant the clean up only is necessary. To carry on a termite extermination program the following is suggested.

A. All wood contacts with the soil should be first eliminated.

B. All points where foundation walls or piers touch the soil should be completely surrounded with about a foot of treated soil.

(1) This soil treatment is done by digging down along the wall or pier to within 14 inches of the footing. The material for treating the soil consists of:

2 parts grade 1 creosote oil
1 part orthodichlorobenzine

Used at the rate of one gallon of the mixture to ten cubic feet of soil, the termites present will be killed and their recurrence prevented for several years.

The method of application is to pour the chemical in the bottom of the trench and then fill in with 16 inches of the earth which was taken from the trench. Subsequent treatments are made at 16-inch levels until the trench is refilled with earth. The chemical will kill vegetation so valuable plants should be moved from the area to be treated. Also in using the chemical the operator must be careful not to get it on the skin for a burn may result.

(2) Points beneath concrete and brick floors that are laid directly on the soil should be treated with the chemical by pouring it through a funnel into holes in

the floor, made with a chisel.

(3) Walls of hollow unit masonry such as concrete blocks or hollow tile should have the chemical poured into the hollow space to eliminate any termites that may be present.

Thoroughness is essential to be successful in this work. It is not necessary to treat along all the foundation of a building if the termites are found active in only one part; but a particular job is necessary on the infested portion to clean out the insects. Spot treatments made at infested locations and followed by subsequent treatments at other points if termites appear are considered good practice.

It is important to remember that after this type of treatment has been used on an infested building, the termites present in the structure above the ground line will soon die if they have no access to moisture above the soil. They will attempt to construct galleries or tunnels back to the soil and these should be detected and destroyed. All connections to other moisture must be broken.

The logical time to prevent termite trouble is when a building is erected. It is primarily the job of the building contractor to see that termite proof construction is done; yet many builders are still a little vague as to what steps are necessary. It is felt that some information may well be had by the prospective owner so that he may insist on termite proof construction of new buildings. Some of the essential steps in termite proof construction are:

(1) Building sites should be cleared of all old wood which will encourage the starting of termite colonies.

(2) Foundations of all kinds should be well constructed so as not to permit internal termite passageways.

(3) All wooden forms and other waste wood should be removed before grading and filling around foundations is done.

(4) Cellar windows and doors should have creosote treated wood or metal frames.

(5) Pipes which pass through basement walls or floors should be surrounded by a collar of coal tar pitch.

(6) Joints in basement concrete or between concrete floors and masonry side walls should be sealed with a non-corrosive metal expansion joint or with coal tar pitch.

(7) Wood steps should rest on solid concrete which projects up at least 4 inches from the soil line so that termite inspection may be easily made. Lattices should be fastened at the top and swing clear of the soil at least two inches.

(8) Ventilation should be provided under unexcavated portions of buildings.

Seed Treatment Is Good Insurance

Condensed from American Agriculturist

BUYING good seed and then allowing seed-borne disease to kill or damage your crop is just as unprofitable as buying a good horse and then hitching him out where he will catch pneumonia. Treating seed to prevent disease is not costly and is mighty good insurance.

Different diseases require different treatment. Materials commonly used are hot water, organic mercury compounds including ethyl-mercury phosphate dust (sold under the trade name of New Improved Ceresan), red copper oxide (sold under trade name Cuprocide), corrosive sublimate, and formaldehyde.

A good example of the use of hot water is to control black rot, black leg, and alternaria leaf spot on cabbage and related plants. The seed is put in hot water at 122 degrees F. for 15 minutes. Thermometer must be accurate because water over that temperature may kill the seed. Sometimes seed is purchased already treated, or treatment is made by the Farm Bureau on a co-operative basis.

Some diseases of tomatoes can be controlled by soaking the seed in a 1-3000 corrosive sublimate solution for five minutes. The solution is made by dissolving 8 corrosive sublimate tablets in 3 gallons of water. Scab and leaf spot on melons and cucumbers can be killed by soaking seed for five minutes in corrosive sublimate made by dissolving 24 tablets in 3 gallons of water. Then rinse in cold running water, dry them and dust them with red copper oxide so they will not rot in the soil. Corrosive sublimate is a powerful poison and eats up metal. It should be used in wooden containers or crocks.

Red copper oxide dust is especially valuable in preventing damping off of vegetable plants and rotting of seed in the soil. It helps to get an even stand and protects the young vegetable or flower plants during early stages of growth.

Smut and leaf blight of oats, stinking smut of wheat, and covered smut of barley can be controlled with ethyl-mercury phosphate dust, by using one-half ounce of dust for each bushel of grain. Treatment should be given at least two days before planting and treated seeds should never be fed to animals.

Formaldehyde will kill loose smut of oats. An easy way to do that is to mix one pint of 40 per

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cent formaldehyde with a pint of water, and to spray this on the oats with a hand sprayer as one man shovels from one pile to another. The amount given will treat 50 bushels, which are then piled up and covered with canvas for five hours.

Heating formaldehyde increases the speed of action. For example, uncut seed potatoes are soaked from three to four minutes in a pound of formaldehyde to 15 gallons of water at a temperature of 124-126 degrees F. to control scab.

Peanut Meal

FEEDING pigs peanut meal as a protein supplement in preference to tankage is likely to result in slower gains at greater cost. In recent feeding experiments conducted at the Kansas Agricultural Experiment Station, pigs kept in a dry lot, and self-fed corn and alfalfa hay with tankage as a protein supplement, made an average daily gain of 1.57 pounds per head; while those self-fed corn and alfalfa hay with peanut meal as a mineral mixture gained only 1.45 pounds.

The feed cost per 100 pounds' gain in pigs fed tankage was $5.50, in comparison to a cost of $5.80 for those fed peanut meal. These costs were based on the following prices: shelled corn, 78 cents per bushel; tankage, $45 per ton; peanut meal, $31 per ton; and alfalfa hay, $10 per ton. Quotations were all open-market.

Peanut meal is cited by experimental workers as having a comparatively high protein content, but only a small quantity of amino acids—substances needed in large quantities in protein feeds for hogs. The meal is also low in minerals, a characteristic that is true of soybean oil meal, linseed oil meal, and other vegetable proteins. For this reason it gives best results when fed with a mineral mixture.—*I. M. H., Kans., Successful Farming*

Pigeon Racing as a Sport

Condensed from The Rural New-Yorker

BELGIUM, cradle of the racing pigeon sport and one of the smallest countries in the world, still leads England, France and America in all phases of such racing.

This pastime of racing pigeons is really a national sport with the Belgians, just as baseball tops the list here.

The Belgians race their birds pretty much the way we race them here, except that they are much more ardent. The story of the Belgian fancier living on a meager diet so that he would be able to afford to feed his birds the finest of grains, and give them the best of training and care is a common one there. But with all their love for their birds they are hard taskmasters, rejecting every specimen that doesn't come up to their highest expectations. Not that they work their birds too hard, just the contrary, they don't burn them up as we do over here.

The young pigeons get their first training at the age of three months when fanciers take them a few miles from their lofts or send them to pigeon headquarters where thousands are gathered, to be released about five or six miles from town on the first training flight. They receive three to four such training flights, each of a greater distance and the first contest takes place over a distance of usually 60 miles. Some pigeons are not five months old when they participate in this first contest, which they fly in about one to one and one-half hours, according to the direction of the wind. Only pigeons raised the same year participate, and they go as far as 250 miles the same season, although prudent fanciers don't race them over 200 miles. In the Fall mixed races are held in which many of the yearlings compete with old pigeons. The second season these pigeons are entered successfully in races up to 300 miles. For bigger distances pigeons three to five years usually do best, while up to the age of seven or eight, they are fit for any competition. The maximum distance is about 800 miles—Antwerp-Madrid (Spain).

The average number of pigeons reaching home from a contest from Madrid is 10 percent. The rest perish on the way or become the prey of hawks, eagles, etc. Dax, France, some 500 miles from Antwerp, is the usual limit for fanciers. From this distance about 10 percent of the pigeons

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reach home the first day, starting at 4 or 5 A.M.. The bulk of the contesting pigeons come home the second day, provided weather conditions are fair. Rainy weather always plays havoc with pigeons, and prevents many from getting home.

Over here we have yearlings doing 600 miles, after a strenuous schedule of one, two, three, four and five hundred mile races. That's why we have so many of these "smashes." (A smash being racing pigeons terminology for losses in a race beset by bad weather.) They prove their slow but sure system by winning contests at long distances with birds that are seven, eight and even ten years of age. Something that we Americans have never been able to accomplish, because we are too impatient.

According to an official census there are more than 400,000 racing pigeon fanciers in Belgium, maintaining approximately 9,000,000 racing pigeons. These fanciers are grouped in 3,500 local clubs, and into a national federation. Each year they breed from 3,000,000 to 4,000,000 young birds which, when added to 9,000,000 old birds, total about 13,000,000 pigeons.

Under the Belgian law each racing pigeon must wear a band officially registered. For each band the fancier pays a tax. Since July, 1932, this tax has been raised to one franc and one centime, and it has produced 7,568,489 francs.

These bands, made of an aluminum composition, have the name of the local city and a number, which enables the identification of any lost bird. The bands are put on the feet when the squabs are six days old. Pigeons without bands are not eligible for racing competition.

From March to October, the Belgian fanciers ship from 10,000,000 to 15,000,000 pigeons to France and Spain, for training and racing purposes, thus creating an annual business which passes the half million mark in francs.

Under a law of July 24, 1923, the Belgian racing pigeon lofts are mobilized in time of war. Each year the Belgian fanciers contribute several millions of francs to carry on patriotic and philanthropic work.

The Belgians really take their pigeon racing seriously. They are still the "great masters" of a sport that is rapidly gaining world-wide popularity.

The details of pigeon contests are as follows:

Friday evening (Thursday for long distance races) pigeons are brought to headquarters for registering. A numbered mark is stamped on one of the wing feathers; the pigeon is then handed to a second party, who

has a rubber ring, numbered, put over the pigeon's claw. The stamp and ring number are entered in a book, and the pigeon is put in a coop, which usually holds 40 pigeons.

These coops are shipped by rail to the point of release, and the pigeons are released Sunday morning, between 5 and 10 A.M., according to the distance to be flown.

When the pigeon arrives home, the fancier takes off the rubber ring, puts it in a bullet-like metal container, and slides it off the roof top through a metal leader pipe to the street, where a runner is waiting to catch it, and to bring it in a burst of speed to a registering headquarters. The metal container is put in a receptacle of a registering clock which registers the time for each individual receptacle and seals it.

Usually the contest runs on a 4-to-1 basis, that is, for every four pigeons entered, one prize is awarded Saturday evening. Special bets are placed at 50c, $1, $2, $3, $4, $5, $10, $15, and $25 at 8-to-1 or 10-to-1, but are not compulsory.

As soon as headquarters feels that enough pigeons have been registered, branches are notified to close the race; the signal is the release of signal pigeons, kept at branch quarters by the fanciers for the purpose.

Within one hour all pigeons in the run for a prize must be brought to branchquarters for verification of the stamp on the wing and then the contest is figured out on the basis of location in flight, and distance to headquarters, from three to six seconds being allowed for every 100 yards of flying from the imaginary town line, and one second for every five or six yards to be covered on foot by the runner to headquarters. If 100 special bets are placed of $1, the 10 or 12 first pigeons of those 100 receive $8 or $10, etc., for the other bets. All the money is put up by the participating fanciers, except that for each race five or more special prizes are awarded for which no bets have to be placed outside of the entrance fee which is nominal.

The speed of the pigeons can be gauged by the fact that 60-mile races are often won in slightly over 50 minutes, with a following wind.

Growing Plants Without Soil

Condensed from Texas Farming and Citriculture

W. H. Friend

Superintendent Texas Experiment Station, Hidalgo County

THE production of crops without the benefit of soil has a tremendous public appeal. Much has been written about the method, and many firms have capitalized on the idea and are selling printed information about soilless plant culture. Chemicals, tanks, supplies, apparatus of various kinds, and test kits are now advertised. The average householder has visions of a few small tanks supplying the family with small fruits, vegetables, and flowers. Unfortunately, the method is not quite as simple as some persons have been led to believe. The purpose of this article is to make public some of the basic facts pertaining to the growing of plants in chemical solutions or sand cultures and to discuss a few of the problems encountered in the actual growing of plants by this method.

Scientists have known for many years the approximate chemical composition of crop plants and have been producing them experimentally in water cultures at a number of the research institutions. Within the past few years, Dr. W. F. Gericke, working with the University of California, did a great deal to popularize the method by working out a system of tanks and trays that made the large scale growing of plants in water more practicable. D. R. Hoagland, also of the University of California, did some of the early work on nutrient solutions, and one of the most desirable formulae is known as Hoagland's solution. The ingredients are rather costly, however, and it does not appear to be necessary to use the ideal formula for many of our common vegetables and ornamentals. Nitrogen, phosphorous, and potassium are the big three in plant nutrition; but calcium and magnesium are also needed in relatively large quantities, while others such as iron, zinc, copper, boron, and possibly others are needed only in very minute quantities, and even very slight excesses may prove injurious. Where commercial grades of chemicals are used in compounding the formula, these minor elements are usually pres-

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ent as impurities in sufficient quantities for all practical purposes. The addition of phosphoric acid or nitric acid to the water to counteract alkalinity and the addition of copper sulfate in quantities sufficient to check undesirable fungi (slime molds) and green algae (moss) are necessary under our particular conditions, because of the nature of Valley irrigation water.

A wide range of plants may be grown in water cultures. Among the plants to be grown indoors, we might mention begonia, coleus, crotons, fancy caladiums, azaleas, ferns, Devil's Ivy, and Vinca. For outdoor use, the amateur tank gardener might use such subjects as alcalpha, gardenia, camellia, rubber plant, gladiola, rose, and strawberries. Vegetable crops which have been most successfully grown in water cultures are cucumbers, potatoes, and tomatoes. Other vegetables may be successfully grown, but these three have received more attention from commercial tank gardeners and greenhouse operators. It is not very practicable to grow large sized plants in water culture, but the enthusiastic hydroponiac may care to experiment with trellised specimens of avocado, cane fruits, grapes, papayas, etc.

Equipment Needed

Probably the simplest set-up for indoor tank gardening is a supply of six-inch one-gallon crocks or 2 quart widemouth glass jars and flower pots to fit into the water vessels. The jars are the miniature tanks, while the flower pots take the place of the trays that support the medium in which the plants are anchored. It may be necessary to enlarge the holes in the pots so that the roots can readily pass into the nutrient holding vessel. For outdoor use, drain tile plugged with concrete can be used in place of the crocks and have much greater water holding capacity. This type of "tank" is especially useful for individual specimens of trellised plants.

Serviceable and relatively inexpensive tanks and trays may be constructed of 1 x 6 and 2 x 6 fir or redwood, but must be securely calked and treated with asphaltum to prevent leakage. A more practicable and less costly tank can be made in the form of an underground pit or trench, lined and floored with brick. These tanks should also be treated with asphaltum to make them water-proof. The asphaltum may be applied in the form of an emulsion but should be melted into the pores of the wood or concrete with an ordinary blow torch. The wire netting or hardware cloth used on the bottoms of the trays should also be coated with asphaltum or some chemical resistant paint, as gal-

vanized wire will increase the zinc content of the nutrient solution past the toxic limit for most plants. Trellises of some kind will be needed to support the tall growing types of plants, as they will not have sufficient root anchorage to hold themselves upright.

Chemicals Required

Plants are composed largely of water and elements obtained from the air. The actual mineral matter contained in the ash is an unbelievably small fraction of the weight of the original plant and its crop of fruit. For example, one pound of chemicals of exactly the right kind should be sufficient for a one hundred pound crop of tomatoes. The other elements are obtained from water and air and are miraculously compounded into the complex tissues and organic substances that go to make up living plant material. Nitrogen, an essential constituent of all living organisms, is needed in greater amounts than the other elements and must be supplied more frequently than the other chemicals, as high concentrations of nitrogen are toxic to plants. Magnesium is essential to the development of the green coloring matter that makes life possible for higher plants, and is probably next in importance but must be in correct balance with calcium for best results. Phosphorous is needed only in moderate amounts, but the problem of keeping phosphorous compounds soluble in alkaline water presents one of our most serious problems. Combination sand and water culture is more successful than straight water culture because of the fact that where a portion of the plants roots are in contact with solid medium which contains insoluble nutrient compounds, the root hairs are able to dissolve sufficient quantities for plant needs. Potassium is used by plants in considerable quantities, but slight deficiencies in the nutrient solution are not likely to seriously check plant growth. The function of iron in plant nutrition is not fully understood, but this element appears to be quite essential to the proper development of all plants. Other metallic elements are required in very minute quantities. Boron is also essential to plants, but concentrations greater than three parts per million are likely to be toxic to most plants. In this connection it might be well to mention the fact that water culture solutions should be quite dilute (about one part of chemicals to 1000 parts of water). The total salts required for a 25 gallon tank would amount to slightly less than three ounces, and this quantity should be sufficient for at least thirty days, even where rank growing plants such as tomatoes are being grown.

The following formulae (for 25 gallons of solution)are suggested for trial:

No. 1:	Ozs.
Calcium Nitrate (add separately)	3.0
Potassium Acid Phosphate	1.0
Potassium Nitrate	1.5
Magnesium Sulfate (Epsom Salts)	1.0
Minor mixture No. 1 B.	0.25

Add calcium nitrate (1 oz. to 25 gallons) as needed to keep plants growing.

No. 2:	Ozs.
Calcium nitrate (must be kept separate in concentrated form)	2.00
Potassium nitrate (saltpeter)	0.50
11-48-O (Ammononium Phosphate) Fertilizer	0.25
Magnesium Sulfate (Epsom Salts)	0.50
Minor mixture 1 B	0.025

Above quantities sufficient for 25 gallons; add calcium nitrate (1.0 oz. per 25 gallons) at two week intervals, or as needed to force growth.

No 3:	Ozs.
Potassium Nitrate	1.5
20-50-0 (Ammonium Phosphate) Fertilizer	1.0
Magnesium Sulfate	0.5
Minor No. 1 B (stock solution)	0.1

Above quantities sufficient for 25 gallons; add calcium nitrate (1 oz. to 25 gallons) at two week intervals.

No. 1 B: (Minor elements)	Ozs.
Iron Sulfate (copperas)	2.0
Manganese Sulfate	0.2
Boric Acid	0.1
Copper Sulfate	0.02
Zinc Sulfate	0.02

Dissolve in 100 ounces of water. Add one ounce to 25 gallons of dilute No. 1 or No. 2.

A convenient method is to dissolve the salts in one gallon of water and use this as a "stock" solution to be diluted at the rate of 1.25, or about one liquid ounce per quart of water. This is especially desirable for indoor use, where plants are grown in bottles or crocks and small amounts of liquid must be added rather frequently.

In addition to the nutrient chemicals, it is desirable to add phosphoric, nitric, or sulphuric acid to the water at the rate of one-half ounce per 25 gallons of river water. This will ordinarily lower the pH from 8.0 to about 6.0, which is a desirable level for most plants. The addition of copper sulfate at the rate of 1 part to 10,000 parts of water has been found to be effective for the control of slime molds and green algae that cause trouble in water tanks, but may be toxic to certain plants that are sensitive to copper. The ability of various plants to endure solutions containing low concentrations of copper salts must be determined by experience. Chlorinated waters

are not suitable for water culture use unless they have been thoroughly aerated.

Supporting Media

Plants grown without soil must have some form of support. Where flower pots are used for individual specimens, coarse gravel and sand or gravel and peat-moss makes a suitable supporting medium. Excelsior has been used for filling trays to be set with seedlings such as cucumbers, tomatoes, etc. Potatoes are placed directly in contact with the wire bottom of the tray and are covered with about six inches of excelsior. Glass wool and rock wool have been used as a media for the support of water grown plants but have too much contact with the nutrient solution. They are also relatively expensive when compared with other materials.

Conclusions

The growing of plants without soil is a most interesting hobby but has its complications and is not a sure-fire method for amateurs. The labor requirements are just about as great as where conventional methods of culture are followed, and overhead costs are considerably greater. The principal economy is in space, and this is not usually a serious consideration, except for apartment dwellers in the big cities. Contrary to popular belief, the rate of development in water cultures is not any greater than that attained by plants in well managed soil of high fertility. It would seem, therefore, that until soilless plant culture has become more simplified, the better types of Valley soil are likely to be more productive of the average run of crop plants.

Fertilizer

THE band method of fertilizing potatoes got a big boost on eleven North Carolina farms when 1938 spuds were dug. There were increases in yields running all the way from two to 23 hundred-pound sacks (with an average of eleven) per acre—increases that had to be credited to the practice of putting the fertilizer in two narrow bands two inches to each side and slightly below the level of the seed piece at planting time.

In figuring the increase in yield due to the newer machinery and methods, yields were compared with those from potatoes planted in fields alongside, where fertilizer was mixed with the soil. Because of these tests, many Tar Heelers will use the band method on their 1939 crop.

Developing Pastures in Florida

Condensed from The Jersey Bulletin

A. E. Marsh

ABOUT eight years ago Mr. B. H. Carlton, a dairyman and livestock dealer, bought an old unused potato farm of 200 acres, located seven miles northwest of Jacksonville, at Spalding station, on the Southern Railway. Having been impressed with the necessity for good pasture, especially winter pasture, if success was to be attained in dairying, he sowed three acres of ground to White Dutch and Alsike clovers with Carpet Grass as a nurse crop, giving what he then thought was a necessary application of lime in the shape of ground oyster shell, superphosphate, and muriate of potash, with a liberal amount of manure. Not much attention was paid to the clover until about three years had passed when he noticed that notwithstanding heavy and close grazing there was a good catch of clover. In order to give it a rest and an opportunity to see what it would do when properly handled the clover patch was fenced, and clover allowed to grow from February 1 until the middle of April, when it was mowed for hay, yielding 14 tons of green hay per acre which, when cured, made three tons of choice hay per acre. This was very gratifying and encouraging and Mr. Carlton commenced at once to enlarge his clover acreage, and by the fall of 1937 had 75 acres in good growing clover and has now 100 acres.

The first sowings were made on the old potato field, land plowed and harrowed before sowing. The last sowings were made without soil preparation. Fertilizer and inoculated seed were sown on wire grass sod with success. Note demonstration plantings by University of Florida on the Carlton land without any preparation of the land, fertilized and seeded November 3, 1937. Plots were seeded with a mixture of six pounds White Dutch clover and two pounds each Black Medic and Persian Hop, inoculated with soil and commercial nitrogen culture. Yields were taken by University people April 8, 1938, with the following results:

Native grass (mostly wire grass), no treatment, 950 lbs. green grass per acre. With application of one ton dolomitic limestone, 1,172 lbs. green grass

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per acre. With application one half ton dolomitic limestone, 600 lbs. superphosphate and 100 lbs. muriate of potash, yield 16,727 lbs. green weight, 4,573 lbs. dry weight. Another plot, one ton dolomitic limestone, 600 lbs. superphosphate, 100 lbs. muriate potash and ten tons manure, yield 37,897 lbs. green weight, 6,534 lbs. dry weight. Another plot with two tons dolomitic limestone, 600 lbs. superphosphate, 100 lbs. muriate potash, ten tons manure, yield 35,719 lbs. green weight, 6,926 lbs. dry weight.

After getting the clover, Blue Grass and Italian Rye fully established Mr. Carlton kept careful record of one 12-acre plot as to number of days grazed, number animals pastured, with the following results: From January 1, 1937, to December 31, 1937, days pastured 165, days rested 200. Number of animals carried on this 12 acres ran from 25 to 140. At times a bunch of horses and beef cattle (25 head) were on the pasture and then the dairy herd, running as high as 140 head. The record shows an average of six head carried per acre. The winter and spring months were the best, figuring nearly seven head per acre from January through June and a little better than five head per acre, July through December. Mr. Carlton's stock have continous pasturage, being shifted from plot to plot as necessary .

What a contrast to other sections and what it means to a dairy man and stock raiser to have abundant pasture every day in the year and further, what it will mean to Florida and possibly south Alabama and south Georgia and perhaps additional territory. As far as I am able to ascertain Dr. Carlton has been a pioneer in successfully providing pasture every day in the year, consisting of clovers and grasses with the best yield during the winter months. Mr. L. M. Rhodes, Commissioner of Markets, State of Florida, in an article in the Florida Grower gives Mr. Carlton credit for successfully demonstrating that clover can be grown in Florida.

High-Quality Roughage

Condensed from **Successful Farming**

F. B. Morrison
Cornell University

DURING the past few years a surprising number of discoveries have been made concerning livestock feeding and animal nutrition. In fact, it has been difficult even for scientists to keep thoroly up to date with the rapid advance of information on these subjects.

These new developments have largely overturned our older ideas concerning the food requirements of animals. We now know that the kind or quality of protein in a ration may be fully as important as the amount of protein. We know that each of several different vitamins has definite functions in the bodies of animals. We know that a sufficient supply of certain minerals is just as necessary as plenty of the ordinary nutrients.

Probably many farmers have been perplexed by some of the statements they have read or heard about certain of these new discoveries. They may have felt that livestock-feeding was becoming so involved that they could not hope for success unless they fed complicated rations to all their stock, including various special mineral and vitamin supplements.

Fortunately, one can supply his animals with sufficient amounts of most of these newly discovered food essentials by raising on his own farm an abundance of high-quality roughage. If a farmer has plenty of such roughage, it is easy for him to make up efficient rations for his farm animals. Except for poultry and swine, which cannot eat much of this fare, all that is needed is good roughage, along with farm grains and the common protein supplements, plus salt or perhaps a simple mineral mixture. Even for swine and poultry, good roughage may be an important source of vitamins and minerals. We can therefore look upon high-quality roughage as the foundation of efficient rations.

Perhaps you are wondering just what I include under the term "high-quality roughage." I put into this class good pasture, well-made hay, and silage. In place of first importance among high-quality roughages I would put good pasture, because it generally supplies the cheapest feed

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during the growing season. Surveys made in seven of our dairy districts by the United States Department of Agriculture show clearly the economy of pasture. In these districts, pasture supplied nearly one third of the nutrients consumed by the milk cows during the year, but the cost of the pasture was only one seventh of the total annual feed cost.

Not only does *good* pasture excel in furnishing feed at low cost, but it has many other virtues. It is very palatable, and therefore stock will get more of their feed from such pasture than they will from most good harvested roughage. Pasture made up of young, actively growing plants is rich in protein, even when it consists only of grasses, without any legumes. For example, young pasture grass from well-fertilized land generally contains more protein, on the dry basis, than does alfalfa hay. Legume pasture is even richer in protein. The protein in most all pasture plants is also apparently of satisfactory quality.

Many farmers do not realize that good pasture is so rich in protein, and consequently they feed stock on such pasture considerably greater amounts of protein supplement than are really needed. For example, dairymen often feed grain mixtures containing 20 percent or more of protein to cows on excellent pasture. Recent experiments in Michigan and Ohio have shown clearly that mixtures having only 12 to 14 percent protein are just as satisfactory for this purpose.

Livestock on good pasture never suffer from a vitamin deficiency, so far as we know. Young pasture plants and, indeed, all actively growing green plants are rich in carotene which animals readily change into the Vitamin A that they require. Good pasture is also rich in Vitamins G, E, and C, and contains a sufficient supply of Vitamin B. In addition, good pasture supplies certain other vitamins or other food factors, including the "grass-juice factor" and Vitamin K. These have been discovered so recently that we do not yet have much information about them. Altho green pasture plants contain very little Vitamin D, stock on pasture have no lack of this vitamin, for it is produced in their bodies thru the effect of the ultra-violet light in the sunlight.

Unless the soil is deficient in calcium or in phosphorus, good pasture will supply sufficient amounts of these minerals. Legume plants can always be depended upon to be rich in calcium.

Good hay has certain characteristics that are very important in livestock-feeding. First, it must

be made from plants that are cut reasonably early. Second, it must be cured in a manner that will save the leaves and preserve as much of the green color as possible; and it must be free from mold.

Such hay has most of the nutritive merits of good pasture. It is palatable. It is generally high in carotene, or Vitamin-A value (altho containing much less, on the dry basis, than the green plants from which it is made). It also supplies Vitamins E and G. Differing from green pasture, sun-cured hay is a good source of Vitamin D. This is because the sunlight, during the curing process, changes certain substances in the green plants into Vitamin D as they die and dry out.

Quite different is hay which is of poor quality because it was cut late or because it was badly injured in the curing process. Such hay, which has little or no green color, is unpalatable to high-producing livestock and there is often considerable waste in feeding it. It has a low digestibility, and therefore each pound that is eaten supplies considerably fewer nutrients. It is much lower in protein, and also generally lower in calcium and phosphorus, than good hay. Even more important, it may have but little carotene, or Vitamin-A, value.

Thus far I have not discussed the difference in value between good legume hay, such as good alfalfa hay or red-clover hay, and good hay from such grasses as timothy or redtop. For all classes of stock except horses, legume hay is superior in value, ton for ton, to grass hay of the same quality. Legume hay is much higher in protein than grass hay, and it is rich in calcium, while grass hay has only a fair to rather low calcium content. Legume hay is also generally higher in vitamins, especially Vitamin-A value, than grass hay of similar quality.

Fully as important as these advantages is the well-known fact that legumes can use nitrogen from the air when inoculated with the proper legume bacteria. Thus they build up the nitrogen supply in the soil, while the grasses lack this ability.

On account of these merits of legume roughage, farmers should provide plenty of it for their stock wherever legume forages can be grown economically.

We have recently conducted a number of experiments at Cornell University to find whether timothy hay could be made a satisfactory roughage for high-producing dairy cows by a combination of nitrogen fertilization and early cutting. Professor Glenn W. Salisbury and I found, first of all, that when old timothy meadows were fertilized with nitrogen, 1,063 pounds more hay

were produced per acre, an increase of one third, and also that there was much more aftermath or second growth on the nitrogen-fertilized plots. By combining nitrogen fertilization with cutting from early to full bloom, the protein content of the hay was increased to 9.38 percent. In comparison with this, average late-cut timothy hay contains less than 6 percent protein.

We next conducted feeding experiments with high-producing cows in our purebred herd to find what they had to say about this timothy hay. During each of two winters, one group of cows was fed each winter on a ration of such timothy hay, corn silage, and a suitable concentrate or grain mixture. Another group was fed a ration of good alfalfa hay, corn silage, and a concentrate mixture lower in protein (so as to furnish the same amount of protein in each ration). Bone meal and ground limestone were added to each ration, tho they probably were not necessary. In both experiments the cows fed the timothy hay ration produced as much milk and fat as did those fed the good alfalfa hay. Also, the cows like the timothy fully as well as the alfalfa and refused no larger proportion of the hay fed, the refusal of both kinds of hay being less than two percent.

If dairy cows are fed plenty of good roughage, high in Vitamin-A value, their milk will be rich in the vitamin. On the other hand, if their roughage is continually of poor quality, the Vitamin-A value of the milk will decline to a low level. From the standpoint of the consumer of milk and other dairy products, it is therefore important that cows be fed rations rich in Vitamin-A value.

In general, well-cured hay from alfalfa and other legumes is considerably richer in Vitamin-A value and also somewhat higher in Vitamin D than grass hay of similar quality. However, in our experiments the early-cut, well-fertilized timothy hay was as high in these vitamins as the good alfalfa hay. Furthermore, the milk produced by the timothy-fed cows contained fully as much of these vitamins as that from the alfalfa-fed cows.

We have long known the merits of silage from corn or the sorghums. Now there is widespread interest in the use of legume and grass silage as a subsitute for part of the hay usually fed, or as a substitute for corn silage.

Silage is a desirable but not an essential feed for dairy cattle, beef cattle, and sheep during the barn-feeding season. It is also an excellent supplement when pastures dry up in summer. We can not consider silage essential because the health and the production of stock may be just as satisfactory when they have an abun-

dance of high-quality hay for the only roughage as when they have both hay and silage. In recent Connecticut experiments, dairy cows that were fed good hay and had water to drink whenever they wanted it produced as much milk and fat as those that had silage in addition.

In all sections where there are frequent rains during haymaking, no small part of the hay is damaged and therefore of poor quality, despite careful handling. On the other hand, it is relatively easy to make silage of uniformly good quality. When a farmer puts some of his roughage into the silo instead of making it all into hay, he is therefore much more sure of having some roughage of high quality for his stock.

I might mention that at the present time there is considerable difference of opinion as to whether it is necessary to add a preservative, either molasses or acid, in order to make uniformly good silage from alfalfa or other legumes. Experiments have shown that if the green legume crop is wilted in the field until it has just the right water content, it may make very satisfactory silage. However, until this method has been tested much more thoroly, I prefer to make sure of the quality of the silage by adding either molasses or acid.

In concluding these statements about the importance of high-quality roughage, I must point out that while good pasture, good hay, and good silage are all superior feeds, they are not complete substitutes for grain and other concentrates. It is true that stock need fewer concentrates for good production when they have plenty of good roughage than they do when their roughage is poor.

Beef-breeding cows that are not nursing calves can be wintered satisfactorily on good roughage alone. Likewise, breeding ewes need, during the winter, but little grain in addition to good roughage. On the other hand, in most of our dairy districts, it pays well to give good dairy cows a reasonably liberal amount of grain mixture in addition to an abundance of good roughage. Likewise, it generally pays to give fattening beef cattle and lambs a liberal feed of grain, plus whatever amount of protein supplement is needed to balance the ration.

New Methods Help Tomato Growers

Condensed from Better Crops With Plant Food

E. R. Lancashire

TOMATOES are grown for the fresh market in every State, and in 37 States tomatoes are grown for canning. How tomato growers harvest round, fully colored fruits instead of flat-sided, puffy, poorly colored fruits; how other farmers have eliminated the laborious task of growing seedling plants in hotbeds and cold-frames; and how still others have overcome the very serious handicap of the hot suns and blistering winds are examined as this story proceeds.

Two years ago, a negro working on a farm near Dyersburg, Tennessee, was told to plant a few hills of field corn between the tomato plants as he hoed his way through the weeds. He planted not a few kernels but a whole field of them.

The final results are all that count, and these were astounding. When the summer sun and winds had done their worst, there remained a 5½-ton per-acre yield of good, average quality, Tennessee canning tomatoes and a 30-bushel per-acre yield of ear corn. The grower was well remunerated for his farmhand's zeal, and it was done on a sizeable field and not on a fraction of space in a backyard garden.

Skipping a year and a few States, we find ourselves way down in South Carolina on the farm of Walter Rawl. In the course of our visit, the story of the negro corn-tomato pioneer was told and partially believed. Once more a commercial planting of canning tomatoes was interplanted with corn at the last hand hoeing. Again the results were almost unbelievable. This time there was a 700-bushel pile of corn in addition to the best colored, earliest, and biggest yield of tomatoes grown in 1938 on this particular farm near Gilbert, South Carolina.

The hot sun and the devastating wind had been fooled again. Such results cannot be laughed away, strange as they may seem. The idea will spread in places where defoliation of tomato plants through disease attack, insect injury, or just plain rundown soil are contributing causes. And on the best of farms the scheme should work even better.

There was still another farmer near Trafalgar, Indiana, who had a fleeting idea of how to grow

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corn in a tomato field. Being in a sweet corn country he planted sweet corn and sold the roasting ears.

Late in September 1938, the tomato plants growing in the shade of the long-dead sweet corn plants were still vigorous of vine and loaded with plenty of large fruits. Needless to say, this farmer will really get down to business in 1939 and grow a man-sized patch of corn and tomatoes, and so too will many of his neighbors.

It has long been known that tomatoes grew redder, bigger, and more abundantly in the shade than in direct sunlight. It is only necessary to look at a crop of tomatoes growing on a north or a northeastern slope and then examine a field of tomatoes handled in identical fashion except for the fact that a south or southwestern slope was used. The odds are all in favor of the cooler. slope.

Apparently, then, the shade is the thing. Tall corn provides the shade in a most efficient manner. Whatever your usual planting distance may be, you have only to plant two kernels of corn between each two hills and let nature do the rest. Perhaps you can narrow a bit the wide difference in yield per acre which annually occurs between tomato fields in cool northwestern New York, where the average yield exceeds 7 tons per acre, and the smaller and smaller yields produced in States which are farther and farther southward and also westward.

Leaving the corn-tomato idea, let us examine the tomato-growing methods used by a farmer in the Lower Rio Grande Valley. Transplanting methods as ordinarily used in most places failed, and so he and his Valley neighbors annually plant 17,000 acres of Rutger's tomatoes by a "direct seeding" method, that is, the seedlings are "blocked out" by cutting out the surplus plants.

Many growers in California and Utah, and more recently in northwestern Ohio, northeastern Indiana, central Illinois, and central Pennsylvania, have gone into "direct seeding" in a large way. William Hertzel, Hicksville, Ohio, was the pioneer of this method in the northern mid-continental States. Today Mr. Hertzel will say he would quit growing tomatoes before he would go back to the old transplanting method.

On a farm south of Urbana, Illinois, tomato-grower Clark took a two-row corn planter, with fertilizer attachment and broom corn plates, and on the afternoon of May 8, 1937, planted 9 acres of Illinois Pride tomatoes. It had been a wet spring and the rain began again just as he finished drilling the field. It rained off and on for the next 3 weeks.

It was June 1 before the soil was dry enough to cultivate, and on that black, fertile, prairie soil of central Illinois the weeds took things over in a big way. The field was a sea of weeds in which farmer Clark had planted 6 pounds of tomato seed.

Clark got the corn plow and first plowed with the rows and then across them. He had left a square foot of weeds several inches high at the place where he wanted each tomato hill to be. With a good, sharp hoe he thinned out each hill, leaving only one tomato plant. It cost Clark $4.00 per acre to hand-hoe the hills, figuring the labor at 25 cents per hour.

To make the story short and to the point, Clark's yield was 8½ tons per acre. Never in his life before had he been able to produce such a yield.

"Direct seeding" has come north to stay, for strange as it may seem, there were 1,000 acres or more of it in Indiana and Ohio in 1938. These tomatoes were planted during the last part of April and withstood a killing frost on May 13. This frost killed transplanted tomato plants in the same territory.

"Direct seeding" does not slow up the date of first harvest, and neither does it result in speeding up the early death of the vines. Yields of "direct-seeded" tomatoes and the quality of the fruit are equal to any produced by the older transplanting system.

The method is not fool-proof. Weeds and run-down soil and insects make results of the system uncertain. However, these hazards are controllable and will not stop the spread of "direct seeding."

The details of the job as worked out by Mr. Hertzel include:

1. Selection of well-drained, fertile soil.
2. Fall plowing clean-cultivated fields for the tomato seedbed.
3. Building up organic content of soil.
4. Thorough fitting of seedbed and seeding one month ahead of normal plant-setting time.
5. Drilling on each acre ½ pound of treated seed ¼ inch deep.
6. Setting drill to space seeds one inch apart in rows.
7. Keeping field free of weeds by means of a rotary hoe operated at high speed.
8. Keeping soil crusts from forming by using a rotary hoe.
9. Dusting or spraying for flea beetle control if necessary.
10. "Blocking out" to desired stand.

It would seem that in the States where the average yield of tomatoes is less than 5 tons per acre, "direct seeding" or interplanting corn between the tomatoes, or both methods used in the

same field, should offer a practical way of reducing the cost of tomato production. Since very few States can boast of an average yield exceeding 5 tons per acre, these two new developments will very likely find widespread usefulness in places where they have not already been introduced.

It is of little use to grow cheaper tomatoes if the color is poor or the fruits are puffy and flat-sided as was the case on the farms of Mr. Hinton near Reedsville, Virginia. The sandy soils of the coastal plain respond most generously to proper treatment.

Mr. Hinton was able to correct the puffy, poorly colored, leather-necked condition of his tomato crop by the addition of organic matter and a liberal supply of a high-grade chemical fertilizer. He first proved to his own satisfaction that organic matter was absolutely essential, and next he discovered that leather-necked fruits showing greenish yellow stem ends and puffy, flat-sided fruits could be corrected by using the right amount of potash in the fertilizer.

Time was when neighbor Hinton grew 2 or even 3 tons of sickly tomatoes per acre, but for the past few years a 10- to 12-ton per-acre yield of fine quality tomatoes has become an established custom.

Skill in the many tricks of the tomato-growing trade will always be essential. If the old, time-honored methods have failed you, and you are not satisfied with the results, there seems no other way out than to try a new method or quit the business.

Perhaps the shade created by a corn plant may be enough deviation to turn the trick. "Direct seeding" will help you further reduce the cost of tomato production. You will at least have a crop of corn in case of a tomato failure. And the correct use of fertilizer will further improve both the quantity and quality of your marketable tomatoes.

Polled Herefords

Starting with only 11 registered Hereford cattle, which by some strange twist of Nature failed to develop horns tho of horned parentage, the breed now known as Polled Herefords has grown from one herd in 1902 to 10,791 herds on September 1, 1938. This rapid growth was possible because when hornless cattle are mated with horned ones, a large percentage of the resulting calves are hornless.

Feed High Quality Alfalfa

Condensed from Farm and Ranch

TOO much alfalfa hay is purchased without paying enough attention to its quality or actual feeding value, says E. E. Anderson, of the New Mexico Extension Service. All dairymen who purchase hay can well afford to pay a good premium for fine stemmed, green colored hay, with a high percentage of clinging leaves.

From two-thirds to three-fourths of the protein of the alfalfa plant is found in the leaves. High grade as well as high feed value is contingent, therefore, to a great extent upon the degree of leafiness. As compared with the stems, the leaves and flowers contain almost three times as much protein, a half more carbohydrates, and more than four times as much fat. Stems, too, are very much less digestible than leaves. That means that when alfalfa hay has a high stem content, it is low in digestibility. Even though a feeder is not interested in a high protein feed, he should be concerned about the digestible nutrient content or total food value.

The leaves of alfalfa contain most of the minerals, especially calcium. In addition, they are the most palatable part of the plant. Palatability is a very important factor in feeding dairy cows. It is a well known fact that in order to get the most economical production, the feeder strives to get his dairy cows to consume the maximum amount of feed, especially roughage.

The color of alfalfa may seemingly be of minor importance to a cow. However, green color indicates a high carotene content. The vitamin A potency of milk and its products depends on the amount of carotene in the feed. When a dairyman is without green pasture, it is highly important that he feed green hay in order to put out the best product possible from the vitamin A standpoint. The cows themselves required vitamin A such as is furnished by carotene for their life and health. Decided and continuous lack of carotene in the feed interferes with normal reproduction and growth of livestock.

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Peach Orchard Development

Condensed from American Fruit Grower

M. A. Blake

New Jersey Agricultural Experiment Station

THE history of the commercial peach industry in America reveals that during certain periods of years extensive plantings of trees are made, following which more peaches are produced than can be sold at profitable prices. In contrast, at certain intervals one or more factors result in a serious reduction in trees.

Peach growers in the East and Middle West have recently experienced a combination of exceptionally severe droughts and unusually low winter temperatures. These unfavorable influences occurred here and there from about 1931 to 1937 and greatly reduced the number of sound, healthy peach trees.

The previous "low" in numbers of peach trees in the East occurred when the San Jose scale eliminated peach orchards by the wholesale, from about 1900 to 1905.

Whenever an industry experiences severe hardships and depression, marked changes are commonly associated with its emergence. Previous to the introduction of the San Jose scale, peaches were largely produced as a general farm crop in the East.

The peach became a special crop when dormant season spraying for the scale and summer spraying and dusting to control peach scab and brown rot were found necessary. These diseases were serious before the scale was introduced but nothing much was done about the problem. When it became necessary to spray to prevent actual destruction of trees it also became important to reduce and control other harmful factors.

At the close of the nineteenth century the so-called Persian type varieties, including Early and Late Crawford, Mountain Rose, Oldmixon, Champion, Reeves, and Smock, were most popular in the Middle Atlantic states. When replanting began in earnest following extensive destruction of orchards by the scale, many trees of Greensboro, Waddell, Carman, Belle, and Elberta were planted. The Chinese Cling type peaches rapidly came to the front, and the Persian type rapidly waned

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in popularity. It was commonly said at the time that the cause of this change was the lack of hardiness of the Persian type varieties. This was true to some degree, but Oldmixon, Champion, Smock, Crosby, Kalamazoo, and others, were actually hardier than Elberta, the most popular variety of the Chinese Cling type.

The Persian type varieties of that period which were hardy produced a rather large proportion of small fruits. Furthermore, the fruits varied considerably in size and time of maturity upon the same tree and also from season to season. The fruits of most of the Persian type varieties also softened quickly at maturity and possessed thin, tender skins. Peach varieties with these characteristics did not meet the requirements of the new twentieth century.

Since the peach industry is again just emerging from the effects of severe hardships and a marked reduction in numbers of trees we may well ponder the situation. Great developments have taken place in recent years in orchard equipment and tools. New pests have appeared. Spraying equipment and materials undreamed of 30 years ago are now in common use. New sources of plant nutrients have been found, and new varieties developed by scientific breeding. Such changes require more knowledge, greater capacity for thought and ability to plan and direct, better organization of a business, and more endurance to withstand mental stress and greater financial outlay.

The changes previously mentioned, together with others, have greatly added to the burden of the grower's supervision and conduct of his business. He finds that he needs at times to act in the following capacities: as an expert plantsman, a good farmer, an efficient employer and manager of labor, a mechanical engineer, a pest control expert, a salesman, an accountant, a lawer, and a banker.

Successful competition in modern commerce is largely a matter of comparatively low cost of production and marketing of an acceptable grade of product. Low cost of production of peaches is obviously based, first, upon a favorable natural environment and the utilization of such favorable factors to the utmost. What nature provides costs little, but what man has to develop and provide may cost much. When one selects a location and a site for a commercial peach orchard, he accepts whatever natural handicaps are associated with it for the lifetime of the orchard. I refer to the climate, the soil, and the topography of the land.

A second class of factors of much concern in low cost of pro-

duction is suitable labor at a fair wage, the opportunity to secure the necessary orchard equipment and supplies at a fair price, and economical marketing.

A third class of factors includes preferred varieties that are economical to grow, arranged in such a manner that they can be efficiently grown, harvested, and prepared for market. It is quite clear that the establishment of a modern commercial orchard is not a matter which should be considered lightly or be hastily decided.

When the details of actually selecting an orchard site are considered, the matter of a favorable elevation above sea level for the district is of prime importance. It often means the difference between a crop of fruit and no crop in unfavorable seasons. It is during such seasons that prices are the best. In New Jersey there are areas where a difference of a mere five to ten feet in elevation means the difference between success and failure in a peach crop in some seasons.

A favorable soil is a necessity for peaches in addition to a proper elevation for the region. Topography of the land and the arrangement of the trees should be such as to provide for economical and efficient servicing of orchard.

By means of an orchard plan, one can definitely arrange in advance for the most efficient care and servicing of the orchard that is possible under the conditions which prevail. Tillage should never be up and down slopes which erode badly, but across the slope. It requires extra power to haul sprayers up steep slopes and it is tiresome for men on the ground to walk up such slopes, especially when the soil is tilled and wet.

Close planting is inadvisable. It not only means too large a proportion of small or poorly colored fruits as the orchard develops, but it often makes it impossible to apply a greatly needed spray or dust in early summer. Most peach growers in the East and Middle West now consider 20 by 20 feet as a minimum planting distance. Orchards with trees set 25 by 20 and 25 by 25 are not unusual.

Soon after the introduction of the San Jose scale in the East, it became a popular practice to head peach trees at 18 to 20 inches above the ground. This resulted in low-headed trees, often with rather narrow main crotches near the surface of the soil. A somewhat higher head is now preferred in the East and Middle West. Growers not infrequently head trees at 30 to 36 inches at planting time. After one year in the orchard the distance from the ground to the lowest branch allowed to remain may be from 20 to 30 inches.

The soil of an orchard site should be fertile before the trees are planted. The term fertile is here used to mean a well balanced supply of nutrients and organic matter sufficient to produce a good crop of corn, tomatoes, or snap beans.

Where the subsoil is well drained but retentive of moisture, as in the case of some clay loam soils, the trees should develop to an extra large size if the surface soil is fertile.

When heavy applications of nitrate of soda, as, for example, 300 or more pounds to the acre, are required to secure a fair growth upon peach trees, it is likely to mean that the soil solution is out of balance and the grower is wasting money by applying only one nutrient. In such cases one should check the need for organic matter and for calcium, magnesium, and the other nutrients. If there is any doubt about the fertility of the soil which is to be set to peaches, quick soil tests should be made.

Peach trees which make a poor growth at the beginning form poor heads and are more seriously affected by root gall, borers, and oriental peach moth. In the more severe cases, there is too large a percentage of dead trees associated with weak trees and the growth of the live trees is too variable.

Trees which possess not more than 25 branches of all lengths, of which one to three are 24 or more inches in length, have made poor growth. It will require an extra year in many cases to bring such orchards into good bearing.

When one-year-old orchard peach trees make a fair to good growth, they will have a spread of three to four feet and possess 40 to 55 twigs of all lengths of which 6 to 10 will be 24 inches or more in length.

Previous to about 1925 the Elberta was the most profitable market peach from Georgia to southern Illinois and to western New York. No earlier ripening peach could successfully compete with it on even terms. Today, some of the earlier ripening varieties in Georgia are said to be more profitable to growers than Elberta.

From about 1905 to 1925 about the only early ripening commercial yellow free-stone grown in the South was Slappey. It never was grown to any extent in the Northeast. Elberta, therefore, had almost no competition, as the ripening line advanced northward, except from earlier ripening white fleshed peaches.

In this new era of increased planting, however, the situation is greatly changed. New yellow-fleshed freestones of good size, color, and quality, ripening before Elberta, are being planted in considerable quantities in the

Northeast and elsewhere.

These include Golden Jubilee, Valiant, Vedette, Veteran, Halehaven and Golden East. Other varieties will be offered next year by nurserymen if reports are correct. It is generally recognized that the edible quality of each of these named is superior to Elberta, in the Northeast at least.

Fruit

CUT a few water sprouts from bearing apple trees before snow falls and place them a short distance from the trunk. Mice, which do untold damage to fruit trees by girdling them, will eat this young succulent growth instead of injuring the trunk.

Refuse, such as dried grass or leaves, should be scraped away from the base of the tree. This treatment will destroy a good winter nesting place.

Young trees should be protected with strong wire guards which should be twelve to eighteen inches in height and set two inches deep at the base of the tree.

This past season has been particularly hard on newly set fruit trees. Heavy rains accompanied by strong winds, have in many cases loosened the soil around the trunk and caused it to sway back and forth leaving a hole. These holes should be filled in with soil and thoroughly firmed. This treatment will prevent the soil from drying out around the roots of the plant and also prevent more roots from being broken or disturbed by swaying.

Some people make a practice of pruning grape vines in the early winter months. It is better to wait until early spring, as winter killing always starts at the tip of a cane and if the cane is cut in the fall the danger of winter injury is much more imminent.—*J. A. A.*

Prolapse and Pickouts

Condensed from American Poultry Journal

Dr. Cliff D. Carpenter

THERE exists considerable confusion in understanding just what a prolapse is and its relation to pickouts. To be accurate, a prolapse is "the falling down of a part," and so, that which the poultry industry refers to as a prolapse is properly called an "eversion," or "turning out of a part," thus exposing a lining of mucous membrane. Broadly speaking, pickouts are cannibalism, and cannibalism is defined as an individual eating one of its own kind. Once an eversion of the cloaca or egg passageway occurs, cannibalism usually follows resulting in a "pickout."

Except for eating insects and worms, the order to which all fowls belong, gallinae, is not by nature carnivorous, that is, they do not attack animal life as a part of their diet; or at most, optionally so. Going back a thousand years or so, it is doubtful if a chicken that lived as a jungle fowl ate much that would classify it as carnivorous, and surely not cannibalistic, if we drew our conclusions from the evidence at hand today.

What then, has occurred to establish this vicious habit so definitely in certain flocks under today's management practices? The answer, obviously, is man, and the thousands of birds both young and adult that are attacked and killed or rendered useless and have to be destroyed, can be charged directly against man's industrialization of the poultry industry.

Toe, wing, and tail picking, or pecking, were unknown apparently as long as the farm hen hatched a brood of 10 to 15 chicks, and was allowed to have the run of the farm. In like manner, several hens, each with a brood, could range their young families together without danger that one or more would be eaten up or badly injured by a brood mate. But brooding chicks artificially in large numbers brought cannibalism. This abnormality starts with curiosity. A spot of direct sunlight hits a chick's foot, attracting the attention of only one or perhaps, at first, then many others. A few sharp curious pecks and blood is drawn. Now, chickens of all ages and varieties like the taste of blood, and unless the unfortunate injured victim is removed, it will be killed shortly by mass attack. The early belief that mineral deficien-

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cies cause cannibalism has been abandoned by most scientists.

Now let's draw a parallel to pickouts. Remember, we said curiosity caused the first peck. Remember further, that birds have no sense of smell and a poorly developed taste sense, and that they consequently set upon new objects, food or otherwise, by a remarkably well developed eyesight.

Many pullets experience trouble in laying one or more of their first few eggs. Sometimes it's because the egg is too large for the not yet smoothly functioning passageway. Such a circumstance often is the result of forcing pullets for production before they are physically mature. Often the edge of the vent is torn and a few drops of blood appear on the surrounding feathers. This blood is especially visible if the injured birds is one of the white varieties, and the moment that the injured pullet is back on the floor, one or more curious birds are attracted to this new bright color, and the result is a vigorous exploratory peck. The follow up is no different from baby chick toe picking. A taste of blood, and unless the injured bird is removed, mass attack soon proves fatal.

If a very great percentage of such immature pullets become injured thus, then cannibalism soon is firmly established in the flock, and drastic steps must be taken to prevent a serious financial loss.

Sometimes vent picking begins with a mild prolapse, and here again it is the result, usually, of early pullet production. Leghorn pullets, especially, leave the nest instantly that the egg is discharged, and many times are back on the floor before the cloacal mucous membranes have returned fully to their normal position. This membrane is highly reddened, and even without any free blood, may attract an attacker. This type of cannibalism prompts the statement that a pickout may be first a prolapse, and occurs chiefly where open nest boxes are in plain view of the rest of the flock.

Just a small amount of engineering can do a lot to avoid this hazard. Most hens and all pullets prefer seclusion for the act of egg laying. Nests, then, should be secluded as far as possible, placing them at the ends or sides of the room. If they can be closed in front, with the only entrance at the rear, so much the better. If short runways lead to these entrances, then the pullets not only have greater seclusions but cannot jump directly to the floor after laying and must walk a short distance first, thus allowing time for the cloacal membranes to return to their normal position.

A California breeder of White Leghorns several years ago tested pedigreed pullets and found

that prolapse followed by pickouts was high in one family and low in another, even though all birds ran together.

Of course, when this acute problem is actually at hand, prompt action may prevent serious losses, for there are on the market several kinds of anti-picking devices designed to make picking impossible. Perhaps the earliest of these mechanical devices was a piece of curved tin large enough to cover the injured or exposed area and fastened to the bird by a safety pin pierced through the skin just above the vent.

Next, came metal guards which were fastened to the back with a small wire. These permit the birds to feed and drink but keep them from pecking straight ahead. Still another variety similarly fastened, prevents the bird from seeing these danger spots when looking straight ahead somewhat as a blinder.

Another precaution that many poultrymen have found beneficial is painting the windows of the house with a special red paint that makes red objects in the house appear colorless.

The fact that annually several million mechanical devices are purchased by poultrymen testifies to the almost universal prevalence of this kind of cannibalism. As suspected, the trouble appears most frequently in large flocks and especially where they remain indoors. An important precaution to observe is to allow 3 to 4 sq. ft. of floor space to each bird because crowding increases the chances of the trouble starting. Also, keeping a hopper of whole oats before the birds has been found helpful in reducing the number of pickouts. Once started however, only exacting vigilance and the appliance of some mechanical device will avoid a serious loss.

Water Held

SOILS used for producing a three-year rotation of corn, oats, and red clover hold 15,600 more gallons of water per acre than similar soils producing corn continuously without fertilizer, says the South Dakota Experiment Station. If lime, manure, and phosphate are used with the crop rotation, the soil will hold 46,500 more gallons of water per acre than when corn is grown continuously.

Fertilizers for Soybeans

Condensed from The Southern Planter

George L. Schuster

Agronomist, University of Delaware

THE census of agriculture reports more than six million acres of soybeans grown in the United States in 1935. Such has been the rise in importance of a crop that has been grown in this country a little more than a century. The soybean was introduced into this country from the Far East in 1804. There were not more than eight varieties grown in the United States prior to 1898. Since that time the U. S. Department of Agriculture has introduced more than seven thousand varieties and selections. Tests as to the suitability of these introductions are made by the U. S. Dept. of Agriculture and the state agricultural experiment stations. It is estimated that there are about fifty varieties generally grown in the United States at present. Our diverse climate, soil conditions and utilization of the soybean creates a demand for many different types or varieties and tests of new introductions are continually being made to improve the crop.

This crop, first introduced as a curiosity and later grown as a soil improver, has entered the list of forage crops and has now entered the industrial field. About one-fourth of the soybean seed harvested enters manufacturing channels.

When a farm crop passes from the role of a soil improver to that of a cash crop, it usually means that at least a part of the crop is removed from the soil carrying with it plant food that will never find its way back to the land. The transition of the soybean from a soil improver to a cash crop has been made so quickly that many growers still retain the thought that it is both a soil improver and a cash crop.

It has been determined by various investigators that an average hay crop of soybeans grown under good cultural conditions will yield between 3 and 4 tons of hay per acre; that the crop will contain about 160 pounds of nitrogen, 40 pounds of phosphoric acid and 110 pounds of potash per acre yield; that the roots and stubble will contain about 9 pounds of nitrogen, 2 pounds phosphoric acid and 6 pounds potash.

Granting that a well inoculated

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crop will obtain about two-thirds of its nitrogen from the air there still remains 53 pounds of nitrogen and the 40 pounds of phosphoric acid and the 110 pounds of potash that are removed from the soil when the crop is harvested. The amount of these plant food materials that will be removed will depend upon a number of factors, such as crop growth and plant food available.

If the crop is harvested as forage and fed to livestock and the manure returned to the land it will require approximately 7 to 8 tons per acre to replace the plant food that has been removed or 700 pounds per acre of a 7-6-14 fertilizer mixture. If the crop is harvested for seed and the straw returned to the soil the plant food removal from the soil is not so acute, but nevertheless there is an egress of plant food from the soil and some method of replacing it should be adopted, if the yielding power of the soil is to be maintained. Some plant food is lost by leaching and chemical reaction in the soil and some allowance should be made for such conditions in planning a soil fertility program.

Soybeans have been grown at the Delaware Experimental Farm since 1912 in a rotation of corn, soybeans, wheat and hay (clover and timothy). A green manure crop of rye and vetch was grown after corn. The hay crop was not fertilized. The total amount of fertilizer applied per rotation and the amount of the total applied to to the soybean crop are given in the following table for five of the highest yielding plots during the period 1912-'24.

Plot	Treatment	Lbs. per Rotation	Lbs. on Soybeans
4	Muriate of potash (K)	270	75
7	Superphosphate (P)	750	250
	Muriate of potash (K)	270	75
9	Nitrate of soda (N)	350	100
	Superphosphate (P)	750	250
	Muriate of potash (K)	270	75
15	Manure (M)	25 tons	5 tons

In 1925 the treatment was modified and the amount reduced and continued until 1936 as follows:

Plot	Treatment	Lbs. per Rotation	Lbs. on Soybeans
4	K	90	18
7	P	375	75
	K	90	18
9	N	38	8
	Dried blood	38	8
	P	375	75
	K	90	18
15	M	10 tons	—

The average annual yields for the 24 year period were as follows:

Treatment	Bu. per Acre
No fertilizer	12.3
K	15.6
PK	21.3
NPK	23.3
M	24.7

All treatments show an increase in yield over the unfertilized plots for the period 1912-'36, but what has been the trend of these yields? In other words has the crop producing power of the land been maintained by these treatments?

More fertilizer and manure were applied from 1912-'24 on all plots than was applied from 1925-'36, but an examination of the above yields reveals that where the larger amount was applied (1912-'24) the original yielding power of the first period (1912-'15) was not maintained in the third period (1920-'24). In other words, what was thought to be a very liberal application of fertilizer and manure at a time when this fertility program was developed has not mantained the soybean yields. During the period 1925-'36 when lesser amounts of manure and fertilizer were applied the yields declined still more until the NPK plot in the last period yields only one bushel more than the unfertilized plot in the first period.

If the average analysis of soybeans for fertilizer constituents is applied to the crops harvested for the twenty-four year period, it will be found that there have been 1272 pounds of nitrogen, 960 pounds of phosphoric acid and 2640 pounds of potash removed from an acre during the period. Approximately half this amount of fertilizer material has been returned to the land in a complete fertilizer (NPK) or manure. The soybeans were grown at the expense of lowering the soil fertility, and decreased yields followed. The yields of the other crops in the rotation have been maintained thus indicating that the fertility program was sufficient for all but the soybeans.

Soybeans were grown on plots that were treated with (1) nitrate of soda, (2) superphosphate and (3) muriate of potash in order to find out more about the importance of these individual materials. It was found that there was a noticeable difference in the effect of these materials upon the yield and the maturity of the beans at harvesting time. The results follow:

Treatment	Annual Yield	Per Cent Mature
Nitrate of soda	10.9	94
Superphosphate	11.1	90
Muriate of potash	15.9	99

Potash is essential in the production of a fully developed mature bean. Potash starvation will produce chlorosis, a yellow

and brown spotted leaf appearance that occurs in the mid-growing season. Delaware farmers have reported the disappearance of chlorotic conditions in soybeans where they have changed their fertilizer applications from 300 pounds per acre of an 0-12-5 to 500 pounds of an 0-10-10.

A study made by the county agricultural agent of Sussex county, Delaware, in 1936 indicates that in producing soybeans the net profit per acre may be increased by the use of fertilizers. He found that the production costs of a 11 bushel per acre crop was $1.10 per bushel and that a 19 bushel per acre crop cost 84 cents per bushel.

Soybeans are an important farm crop. They have a large number of outlets for utilization, but if they are to be produced profitably the soil fertility must at least be maintained if not increased. Experiments at the University of Delaware have proved that a sound soil fertility program is essential to success with soybeans.

An examination of the yields given by periods in the following table reveals that the soil fertility has not been maintained.

Treatment	1912-15	1916-19	1920-24	1925-28	1929-32	1933-36
No fertilizer	17.5	13.0	11.0	10.0	9.5	11.4
K	20.4	15.8	15.8	14.8	12.5	15.0
PK	26.8	22.3	22.0	17.2	20.0	18.5
NPK	26.8	25.7	25.3	19.4	18.2	18.4
M	29.1	29.6	23.7	21.4	19.7	23.8

Getting the Most Out of Nitrogen

Condensed from California Cultivator

Willard G. Babcock

A GREAT deal of interest has been aroused on the subject of hydroponics as a result of recent experiments in the field of water culture. Occasional large crops of excellent quality have been raised by trained men equipped with proper facilities, without the use of soil. The plants are grown in tanks or tubs and all of the required plant foods are supplied in the solution which is maintained in the container. As additional amounts of any one element are required during the growth of the plants, they may be added in a soluble form.

In addition to its interest as a method of producing crops without soil, it serves to emphasize an important method of fertilizing crops which are raised in soil, namely, the addition of plant foods in soluble form through the irrigating water. For years investigators have grown plants in pure sand adding the required plant foods as they desire. The sand provides only the proper environment for root growth by furnishing an anchor for the roots, moisture storage, etc. The required nourishment is supplied in the solution used for watering the plants.

In the light of these methods of raising plants, soil may be considered from the viewpoint of providing a necessary anchor for the plant and a medium for normal root development in which deficient plant foods may be supplied in soluble form through the irrigating water. If a soil has the right texture for allowing normal root development all required plant foods may be added in some form of fertilizer. Rich soils well suited to agriculture not only supply the proper environment but also supply the elements required for plant growth. Sooner or later with continued cropping, some of these elements become depleted and must be replaced by some form of fertilizer. The maintenance of an adequate supply of nitrogen in the soil presents one of the major problems in raising most of the irrigated crops. The system of supplying nitrogen to growing plants in soluble form through the irrigating water has passed through the experimental stage, having been used extensively on a commercial scale for a number of years. The nitrogen

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requirements of practically all irrigated crops can be taken care of, for the most part, more satisfactorily by application through the irrigating water than by other methods.

Fertilizing methods may be divided into two general classes. First, the usual one of applying solid materials which are either spread on the surface of or drilled into, the soil. In either case the fertilizer thus applied can not be distributed to much greater extent than the area reached by the tools used for incorporating it into the soil. Fertilizer applied in this manner must undergo such changes as are necessary to render it soluble before it can be transported through the soil by the movement of soil moisture. When applied to orchards where the roots are already established, there can be no benefit to the trees until the material has been dissolved by the soil moisture and transported to the roots by rain or irrigating water. Second, the application of soluble fertilizer in the irrigating water. The use of this system has been gaining very rapidly as it has many advantages over the older, conventional method. In the first place it is more economical. The cheapest source of materials may be used. It is not necessary to store up large amounts, prior to planting in case of field crops, or prior to the rainy season in the case of orchards, in order to insure an adequate supply during the growing season. Due to the increased efficiency, less amounts are required. Secondly, better quality and quantity of products may often be obtained.

This applies to both field and orchard crops. A notable example may be seen in fertilizing lettuce. It has been found that the quality of head lettuce is decidedly improved by applying nitrogen in the irrigating water at a certain stage in the development of the plant. A moderate application of suitable fertilizer is made prior to, or drilled in as a side dressing after planting. By using a soluble form of nitrogen in the irrigating water the needed nitrogen is brought in contact with the roots at the right time to produce a very much improved quality of lettuce. It is not desirable to encourage too much plant growth in any field crop grown for the fruit or seed, by applying sufficient fertilizer to mature the crop prior to planting. Better results are obtained by using only enough fertilizer before planting time, frequently none is required, to insure a satisfactory start for the plant or vine, and then adding the desired amounts of nitrogen in soluble form through the irrigating water at the proper times during the fruiting period. The advantages of this procedure are particularly

noticeable in raising tomatoes. Too much fertilizer in the early stages tends to produce more vines and less fruit. Little or no fertilizer used before the plants are set out, followed by applications in the water after the blossoms start, tends to produce an adequate vine and much more fruit. The response from applications of nitrogen made in this manner is quick and decided. Therefore, a grower who has noticed a nitrogen deficiency by the appearance of his plants may correct the situation, without loss in yield, by making an application through the next irrigation.

This method of applying soluble nitrogen in the water is particularly well adapted to fertilizing orchards, especially citrus. Investigations show that large amounts of nitrogen are lost through the leaching effect of winter rains during years of normal rainfall. Yet when fertilizer is broadcast it must be applied prior to the rainy season if any appreciable amounts are to be carried into the root zone, unless flood or overhead systems of irrigations are used. Thus a great deal of the fertilizer broadcast in the summer or fall may be carried beyond the root zone by winter rains before there is opportunity for the trees to make use of it. By applying soluble materials in the irrigating water, the required nitrogen may be carried directly to the roots at just the time when it is needed most. That is, when the crop is being developed and the trees are making their greatest growth.

Size of Good Layers

RESEARCH workers at the Missouri Agricultural Experiment Station have studied the correlation between size of hens and annual egg production, and have concluded that for Leghorns an average weight of 4 pounds is most desirable. Leghorn pullets that weigh from 3¼ to 3½ pounds when they lay their first egg will usually weigh about 4 pounds the following March when they are a full year old.

For Rhode Island Reds and Barred Rocks, the best weight for high production was found to be 5¾ pounds at maturity. These conclusions are stated in Research Bulletin No. 278 by Brody, Funk and Kempster.

The Baby Capon Specialist

Condensed from The Poultry Item

W. F. Wilmarth

THE practice of capon production has long been known to be remunerative. However, due to the fact that few poultrymen are able to perform the operation successfully themselves, this field of the poultry industry has never been well developed. Many hatcherymen, realizing this, have been trying for the past three or four years to find some successful method of operation on very young birds that they might be able to offer the poultry grower started chicks which have been caponized.

Since all started chick business centers around the ages of three or four weeks, this has been the time which has seemed necessary to perform the operation if these chicks could be offered poultrymen.

Four-week-old capons could be sold in direct competition with turkey poults. The price would be approximately the same per bird, with an added incentive for buying the capon in that they were through the danger period of those first starting weeks. Then too, they would fill that need of many poultry raisers who know how to grow chickens successfully but have always been skeptical about trying turkeys. For these poultrymen the baby capon would be ideal, for they could grow a heavy bird that they know how to develop and receive a premium when it is sold.

One of the first successful attempts to caponize chicks was done with the use of electric instruments. With this method an electric knife and electric removers are used which cauterize the wound and so prevent excessive bleeding and possible infection.

There are some difficulties encountered with the use of this method which make it unsatisfactory for chicks in commercial numbers. As these instruments depend on a small filament wire to heat for each operation they are necessarily slow to work with. This is no handicap when there are but a few birds to operate on, but when there are large numbers, it very definitely increases the labor cost per chick.

During the past year there has been developed a new method of caponizing three-week-old cockerels which promises to give very satisfactory results.

Carefully kept records of this work show that 600 chicks are

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easily caponized per day by an experienced operator and that his percentage of mortality or slips will not be over five percent average. Surely these are exceptionally good results when compared with past records which show losses up to 20% and slips often as high as 30%.

Fundamentally this method is the same as that which has always been used in caponizing the older 10-week cockerel, the only principal change being in the location of the incision. It was found that most of the mortality occurred directly after the operation from a condition known as "false gapes." Separate bronchial tubes of the lungs are continued by air-sacs which are found in the abdominal cavity. These air-sacs are ruptured during the operation and the lungs, in attempting to compensate for oxygen lost, are overtaxed and the chick suffocated while gasping for breath. By changing the location of the incision this condition was remedied, and while the air-sac was still ruptured the wound closes more tightly, thus preventing this loss of oxygen.

One other advantage was also observed in making the incision differently in that all local hemorrhage was eliminated. As a nerve, artery and a vein pass along the posterior border of each rib, bleeding from these ruptured tissues was eliminated as the cut was made directly away from all bone.

Except for the removers, standard instruments are used for this operation. Removers are of the forcep type and are smaller than those generally used. Both testes are removed from one incision, thus lessening shock to the bird, as compared to making a cut on both sides of the chick. Greater speed in operating is attained by having to work from one side only.

No difficulty has been experienced from infection when ordinary precautions are used with a good antiseptic. Since all birds show a high resistance to the common germs of infection, loss from this cause is always very small.

Although the entire operation is very simple, less than one minute of time being required to do a chick, only adequate practice on a large number of birds will give efficiency in doing the work properly. Deft fingers and excellent eyesight are absolutely necessary if an operator is to become thoroughly skilled at this work.

Today our poultry industry is highly specialized. We have men who are experts in breeding, in incubation, and in sexing. All of these men are indispensable if our hatcheries are to give the service and the quality of chick desired by poultrymen.

Milk in Gallon Jugs

Condensed from Holstein-Friesian World

E. M. Clark

WHEN the net price of milk for the Detroit market got down below three cents a quart, Norman Topping, a Holstein breeder of Stockbridge, Mich., decided he would do something about it. On August 1st, starting from scratch, he went into the retail milk business in the village of Stockbridge, population 700 to 800, located about three miles from his farm. He decided that the old quart and pint bottles were obsolete so he started with gallon milk jugs, selling his milk at twenty-five cents per gallon. His idea was a success right from the start. Today he is selling 60 gallons per day all for cash, either a quarter in the empty jug or tickets in advance.

When interviewed, Mr. Topping cited several cases where this low price of milk has increased consumption. One case he tells about is a family which had never used over a pint a day, now takes a gallon, or eight times as much as was formally purchased. Another family that was taking four quarts a day in quart bottles, now buys two gallons a day. Many customers buy every other day, thus cutting down delivery expense.

Mr. Topping believes that the less the milk is handled the less chance it has of being contaminated. Bacterial counts prove him to be correct. His milk never runs over half the legal requirement for pasteurized milk and is below 10,000, the maximum for certified milk. His herd of 36 Holsteins is milked by machine, the milk is then strained into ten-gallon cans and cooled. The wide-mouth gallon jugs are filled directly from the ten-gallon cans by pouring. The jugs are then capped by hand and are ready for delivery. A small, well insulated compartment was built into his pick-up truck which holds 60 jugs. This will have to be increased in size as the business grows. It takes about 2½ hours to deliver the 60 gallons, which means a daily cash income of $15.00, more than double what he would receive on the Detroit market. Not all of the milk is retailed as yet, the balance goes to Detroit at the base price.

The only added equipment which was necessary for Mr.

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Topping to get to go into this gallon milk business was a supply of gallon milk jugs. And the customers buy these jugs at 15 cents each, the price Topping pays for them in gross lots. The jugs are returned in very clean condition, but Topping gives them another washing and then rinses them in a chlorine solution. All utensils are sterilized with the chlorine solution. Many markets require all milk, except certified milk, to be pasteurized. This is not the case in Stockbridge, so Topping is spared this trouble and expense.

There are literally thousands of small towns in which our breeders could duplicate Topping's experience. Some would have to install a small pasteurizing outfit. The consumer wants good milk at a reasonable price and the gallon jug seems to be the answer.

Hay for Hogs

GREEN, leafy alfalfa, clover or soybean hay is a valuable addition to the winter ration for hogs. It may be fed whole in racks or ground and mixed with the regular ration.

Pigs should receive a fifth of a pound, fattening shotes a fourth, and breeding stock as much as a pound or more leguminous hay daily a head.

In trials conducted at the Ohio Experiment Station, alfalfa enabled fall pigs to be marketed two weeks earlier and each pound fed saved 3.3 pounds of corn and a half pound of protein concentrate. Leguminous hay also helped in preventing lameness and resulted in pigs with greater vitality at birth. —*Ohio Farmer*

Trade Barriers Between States

Condensed from Market Growers Journal

STATE laws of great variety restricting movement of trucks now constitute an important discouragement to interstate commerce that is being studied by the U. S. Bureau of Agricultural Economics, with view to a better program of remedial legislation.

Dr. George R. Taylor, of the Bureau, says that three types of State legislation are found restrictive, (1) licensing requirements and taxes on out of state trucks; (2) regulations dealing with weights, sizes, equipment of out-of-state trucks; (3) post of entry laws.

Some states collect no ton-mile tax nor require out-of-state private carriers to take out license, providing they do not engage in intra-state business, thus competing with home carriers, and also providing other states from which these trucks come, give similar treatment to the domestic trucks. Typical examples are New York, California, Ohio, Massachusetts.

But another group of states, including Arizona, Kansas, Oklahoma and Wyoming, require all out-of-state trucks to register and pay a fee or pay higher ton-mile taxes than their home trucks.

Still other states, like Florida, Colorado, Minnesota and Virginia, while having strict license laws for out-of-state trucks, also have legal provision for liberalizing them through what amounts to reciprocal trade treaties with other states. Thus are trade barriers being laid down between the states as though they were 48 separate little nations.

The curious part of it all is that the restrictive laws are intended in each state to benefit domestic business — especially farmers. And there are several schools of thought about this, even among the farmers and their friends.

Colorado potato growers in August, 1935, had to appeal to their State Public Utilities Commission to relax its requirements so that out-of-state truckers could come in and move their crop, much of which goes to market in this fashion, rather than by rail. Peach growers in South Carolina, more recently had a similar experience.

Kansas people, says Dr. Taylor, report "interminable trouble in farm truck transportation between neighboring states."

Ports of entry for out-of-state trucks came into fashion as the

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restrictive laws increased. Kansas seems to have started the idea about five years ago and now has 66 posts of entry. Oklahoma has 58. Other states that have adopted this bit of taxing machinery are Arizona, California, Colorado, Idaho, Nebraska, New Mexico, Utah.

On the other hand, many growers and their advisers are of the opinion that "self preservation is the first law of nature" and honestly think such trade barriers erected against out-of-state competition will help them.

Marketing officials of the states, at their last annual convention, featured discussion of this trade barrier problem in an effort to find ways and means to stem the tide of laws that are causing conflict between states. It was agreed the problem has become a national one and only national legislation can cure it. But also it seemed clear that states would first have to authorize such action through united co-operative and uniform agreement.

Otherwise the enthusiasm of taxing agencies will eventually result in similar restrictive laws between counties and even smaller units.

Indeed there have already been a few such instances. The case of four men from Winona, Minnesota, who tried to sell their vegetables in Rochester, Minnesota, last May and were fined $30 each in the Rochester Municipal Court is a typical example of the absurdities to which these trade-barrier laws can and do go.

The punishment meted out to these farmer boys for daring to seek a market for their produce in their own state only a short market distance from their home town, was due to a restrictive law adopted by the town of Rochester, popularly known as the Green River Ordinance, because it was first invented in Green River, Wyoming.

This sort of ordinance seeks to "protect" home industry, by keeping out all peddlers and solicitors from elsewhere. So, probably to the surprise of Rochester people, it turned out that even farmers (from another town) selling vegetables from door to door, are no exception.

The "Green River Ordinance" starting in Wyoming eight years ago, has spread to more than 437 municipalities, mostly small towns, scattered over all the country.

Originally sponsored by three manufacturers whose salesmen probably encountered local restrictions more often than most, because of their door to door policy, it gives aid now to all efforts to remove trade barriers between states and towns.

In three states, Florida, South Carolina and Maryland, the su-

preme Courts have declared the ordinance illegal.

In Palo Alto, California, a newspaper campaign resulted in defeat of the "Green River" ordinance there by a 5 to 1 vote at the polls. One hundred merchants who found that the law hurt and embarrassed them instead of helping local business signed a public appeal that the ban against "itinerant merchants" be removed.

Aberdeen, S. D., went "Green River" and repealed her ordinance a month later. It simply did not work as expected.

Even Green River, where the model law started, finds that where "it used to cost a dollar to get a dollar's worth of goods into the hands of the consumer, now according to some recent studies by economists, it costs nearly a dollar and a half." We quote the Green River Star, its weekly newspaper.

Nevertheless the town sticks to its ordinance, so many copies of which have been called for from all over the country, that the Town Clerk has hopefully suggested that applicants might pay $5 each toward paying legal expenses. But he leaves that to the applicants generosity and sense of fairness.

That the "itinerant peddler" is often a nuisance, and in such case should be "regulated" by equitable laws that protect both producer and consumer seems to be generally agreed. Fake seedsmen who prey on the farmer; high and low "pitchmen" to whom fraud is too often a necessary factor in success; the "sucker list" expert and the "fly-by-nights" can be eliminated without stopping the free flow of commerce with senseless statutes and ordinances of the "Green River" variety.

"For the Nation as a whole," says Wells A. Sherman, "the erection by individual states or localities, of barriers or impediments to trade, there is one sure effect. A greater or smaller number of citizens are denied some of the good things of life which they might otherwise enjoy—the Nation is poorer because of their deprivation."

"The fostering of illwill is another inevitable result. . . . The State which passes (such) laws, may be classed with the man whose practical joking results in property damage at which he merely laughs."

Improved Methods of Sampling Milk and Counting Bacteria

Condensed from Farm Research

Robert S. Breed

BECAUSE clean, high-quality milk should receive financial recognition when purchased for distribution to the consumer, several recent investigations in the dairy field have been directed towards improvement in the analytical procedures used in determining milk quality. These investigations have dealt with methods of counting bacteria in milk as count standards are generally used both as a basis of payment to dairymen and as a means of determining the grade of the milk sold.

In carrying out any analytical procedure, the first essential is that the material to be examined be sampled properly. It is self-evident that any sampling of milk to determine the number of living bacteria present must be carried out with sterilized equipment. The sample must not be contaminated by living bacteria already present on sampling tubes, sample bottles, and the like. After the sample is taken and until it is examined, it must be kept cold to prevent growth of bacteria.

Moreover, the small amount of milk examined must be representative of the entire batch of milk whose quality is to be determined. After study of the problem, it was reported in Bulletin No. 673 that, altho the weigh vat sample could not be perfectly protected against contamination at Grade A receiving stations, it was more desirable as a means of judging the quality of the milk supply delivered by a given dairy than a sample taken from an individual can. Because of a ruling of the State Department of Agriculture based on the results of this investigation, premium payments made to Grade A dairymen since July 1, 1936, have been based on an examination of weigh vat samples.

Even after a proper sample is secured, analytical procedures should be carried out with sufficient precision to yield bacterial counts that can be duplicated within reason in a series of laboratories when duplicate samples of milk are examined. Because it is difficult to count objects as tiny as bacteria, especially where they occur in tens or

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even hundreds of thousands per cubic centimeter or "cc" (15 to 20 drops), so-called counts really become estimates of numbers.

As long ago as 1905, workers who belonged to the Laboratory Section of the American Public Health Association, realized the importance of standardizing methods of counting bacteria in milk and cream in such a way as to improve the uniformity of results secured from duplicate samples. Progress has been made in this field thru the publication of a series of editions of the so-called Standard Methods of Milk Analysis of which the seventh edition is now in press. The methods have been generally accepted and followed in North American countries. Nevertheless, thruout the period from 1905 to the present time, it has been shown with disconcerting frequency that the procedures for counting bacteria in milk by the agar method were not yet perfected sufficiently to yield entirely reliable results.

For these reasons, during the past five years a number of investigations have been made in various parts of the world as well as at this Station which have had for their object the development of a culture medium which would grow the bacteria commonly found in milk supplies more satisfactorily than the standard agar in use at the present time.

It has also been definitely shown by investigations that when these agar culture plates are incubated at 37°C (human body temperature) many bacteria do not find this temperature favorable for growth. It is now known that during the process of pasteurization, bacteria that find high temperatures ideal for growth may grow in the hot milk and be present in large numbers in pasteurized milk, altho they will not grow at as cold a temperature as 37°C. Moreover, now that dairy products are frequently refrigerated for days, weeks, or even longer periods, particularly in the case of cream and ice cream, it has been shown that bacteria which find low temperatures suitable for growth may grow in these dairy products at cold temperatures. These bacteria find 37°C too hot to permit development on agar plates. This being the case, there is no one temperature that can be used which will grow all of the bacteria that may be present in any given milk sample.

For this reason, there is an increasing interest in the use of the direct microscopic examination of various types of both raw and pasteurized milk and cream. While it is impossible to tell whether the bacteria seen under the microscope were living or dead at the time the sample was taken, it is now more thoroly

realized that (1) dead bacteria commonly do not stain with methylene blue and are therefore invisible in microscopic preparations, and (2) that no high class milk or cream should contain large numbers of stainable bacteria, either living or dead. While it is a tedious process to make exact counts with a microscope, an examination quickly shows whether the milk or cream contains (1) so small a number of bacteria that they cannot be readily found with the microscope, (2) a medium number of bacteria, or (3) excessive numbers of bacteria. Such a classification really corresponds with a classification into high class milk, a satisfactory grade of milk and a poor quality of market milk.

The conclusions reached in investigations at this Station have also been examined in other laboratories. Because these investigations have supported the conclusions reached in the Station studies, the American Public Health Association accepted the formula for standard agar developed at this Station at their recent meeting in Kansas City, Mo. This new agar will be introduced July 1, 1939, into public milk control work thruout the United States and Canada. Thru its use, somewhat higher but more accurate counts of the bacteria present should be secured.

Because laboratories doing milk work very generally use their incubators for types of public health work which require a temperature of 37°C and because of the limitations so generally placed on the budgets of these laboratories at the present time, it was not felt that 32°C incubation, desirable as it is, could be required at present. This is unfortunate from the standpoint of the dairy farmer whose samples of milk are generally examined in laboratories whose main purpose is that of examining milk samples because bacterial counts made at 37°C are not as accurate as those made at 32°C.

Greater accuracy in the making of bacterial counts from milk samples is highly desirable, both where premiums are to be paid on the basis of the count and also where public health officials are making analyses to determine the grade of milk. More accurate results can be secured by the development and use of better analytical methods.

Geese as a Sideline

Condensed from New England Homestead

Robert M. Mead

FOR some reason or other geese are among the best known yet most neglected of fowl. They have a distinctive flavor and are easy to prepare for the table yet most meat markets feature them, if at all, only for special holidays. They are one of the fastest growing birds in existence and much hardier and easier to care for than the much publicized turkey. If suitable marketing facilities could be developed there is no reason why New England farmers should not grow thousands of geese each year as a sideline to other small farm projects.

Of the purebred geese the Toulouse and Embden seem to be about the best of the large type geese and the Brown Chinese the best of the smaller more prolific breeds. The large geese will lay about twenty-five eggs per year, the smaller so called "leghorn" type around fifty. All geese are rapid growers and if desired the purebred geese can be used for market geese although we use cross breds to obtain maximum vigor and growth. One of the most successful crosses we have used is the Toulouse x Brown Chinese cross using a large type Toulouse gander on Chinese females. The young geese from this cross grow very rapidly and mature at a size almost equal to that of Toulouse. Also by using an egg laying breed for the female side of the cross a large number of eggs are produced per mating.

Geese should be mated as early in the season as possible using a gander to two females and providing water for them to swim in whenever possible. Geese will mate on dry land but fertility will average better if they have a small pond to get into. They will usually lay by March and the eggs should be gathered as soon as possible after they are laid. Store in a warm dry place until ready to set them but do not hold over ten days.

Geese eggs may be hatched under hens, broody geese or in incubators. The incubator is the most satisfactory method if any number are to be reared, and the large cabinet type machine the most satisfactory to hatch them in although they can be hatched in small flat top hot water machines if enough care is taken.

Reprinted by permission from the New England Homestead, Springfield, Mass.

Follow the manufacturers directions for hatching goose eggs and remember that too much heat will result in poor hatches or weak worthless goslings.

They can be brooded under any type brooder that is satisfactory for chickens, giving about the same heat as for chickens the first week only. After that heat may be reduced considerably so that by the time the goslings are five to six weeks of age they need only a warm dry place to stay nights and on chill wet days. Until they are well feathered they should have drinking water only as needed, as they are clumsy and will often drown themselves if given half a chance.

Feed Well

Feed, and lots of it, is the most important part of a gosling's life for the first three months. Any good chick or duck starter can be used for the first five weeks and after that a good growing ration. Whatever mash is used should be fed moist, at least three times a day, just what they will clean up in fifteen minutes or so. For the first ten days they are small eaters, then as they start to grow they will not only consume more and more mash but a tremendous amount of grass and clover. The easiest way to furnish them this green feed is to give them a good clean range, where, at least while they are small, the grass is not over three inches high, and young and tender. They must be got under cover before severe thundershowers or hail storms. Once feathered they will stand almost anything but a few precautions should be taken.

Once well grown, one feed of mash and one of corn and oats per day with plenty of range will keep the young birds in fine shape until sold. The main thing to remember is to give them plenty of good feed during the critical growing period which is up to about nine to twelve weeks of age. They should make a total gain of about a pound per week during this period and we have grown them to weigh eleven pounds at nine weeks.

Hybrid Grain Sorghum?

Condensed from Capper's Farmer

Ward Barclay

WOULDN'T announcement of 150 bushel grain sorghum set the next meeting of any southwestern local Agricultural Conservation Association agog?

Well, there is such a grain sorghum, or at least the way of producing it is known. And the plant breeder who has done it, and can do it again, is alive and still worrying about what he discovered. But there's a "ketch" in it. The 150 bushel hybrid under favorable growing conditions has no terminal facilities upward short of 15 feet and seems in no hurry to mature ahead of frost.

Now the Plains farmer likes his grain sorghums below the belt if possible. And plant breeders have been directing their researches toward producing that stature, along with some reasonable maturity period. Even where there are upward of 200 days of growing weather, drouth may make even sorghums which are able to survive it mark time 60 days or so delay growth that seed can't mature.

But despite any drawbacks it may possess, a sorghum, or any other grain crop, capable of producing 150 bushels an acre could be calculated to set scientists by the ears. It did just exactly that to R. E. Karper and J. E. Quinby. If crossing two such old standbys as Hegari and Feterita, both of reasonable height, would create such a disturbance, what would be the possibilities of hybridizing grain sorghums to acquire that vigor which in recent years has made plenty of previously normal farmers go plain nuts about hybrid corn?

Karper, Quinby, J. C. Stephens and associates at the Chillicothe, Texas, Substation, have made plenty of crosses to indicate those possibilities. They've learned which parentages may be combined without creating a gigantic offspring. The biggest grain yields seem to have been produced by the tallest hybrids. But there are some which improve forage yields and grain yields without much increase in height and maturity season.

And that is getting somewhere. Further, these hybrids lay corn hybrids in the shade in the matter of percentage yield increases. They are credited not with a few bushels advantage, such as hy-

Reprinted by permission from Capper's Farmer, Topeka, Kansas, Dec., 1938

brid corn producers brag about, but with twice or three times the yield.

It may restrain farmers from writing in for some of this seed, to know that no practical method of producing hybrid seed of these sorghum combinations in quantities has been developed. Most of you know that corn may be self pollinated, that the male and female flowers are produced on the same stalk, but that they are considerably separated. Male flowers are borne on the tassels and female on the ear spikes. To effect cross pollination it is only necessary to jerk out the tassels before pollen is ripe.

Sorghums likewise are self pollinated and are more likely to be that than corn, altho they do cross naturally. Now to control the crossing is quite difficult because both male and female flowers are borne in the head. To insure crossing it is necessary to practice hand emasculation (pulling male flowers out which is a tedious and time consuming job) and hand pollination. A method of emasculation with hot water has been developed and considerable quantities of hybrid seed, enough to facilitate research studies, have been produced. But that method will need to be improved or modified radically before quantities for practical field production can be made available.

But here's a new hope. In 1935 a male sterile plant of black hull-kafir was found. Such abnormalities have been observed before. The happy coincidence in this case was that a cross between blackhull and red kafir had been proved desirable. The hybrid grows no taller than either of the parents altho it tillers more and has yielded twice as much grain as the most productive parent. Its maturity season, fortunately, is the same as that of blackhull which is earlier than the red.

Now the problem for the plant breeder is to fix, or otherwise increase, that male sterile abnormality. If he can do that, he'll be on his way. How soon the goal can be reached is unpredictable.

"Hybrid sorghum seed will be more expensive to produce than hybrid corn," Mr. Stephens estimated, "but fortunately the cost of seeding an acre need not be prohibitive, because of the small quantity required. If a grower were assured of getting no more than 10 bushels increase, he could afford to pay up to $1 for seeding an acre instead of approximately 10 or 15 cents if he used common seed. If the hybrid performs under farm conditions as it has experimentally, an increase much greater than 10 bushels could be expected.

"Possible procedure of the seed grower would be to go into his

fields before heads emerge, open the boot and examine the head. If the flowers were normal, he would cut the plant down. If they were male sterile he would leave them to be pollinated by the red kafir parent. The resulting seed would be hybrid for planting a commercial crop. Such production would be practically feasible. Possibilities for yield increases are enormous."

Will the readers please restrain their urge to correspond with the plant breeder. He is quite busy already with the problem of making hybrid sorghum seed available. Announcement will be forthcoming in due time when, and if, he succeeds.

Cleaning Gutters No Chore

Condensed from The Ohio Farmer

E. W. McMunn

PROBABLY every dairyman has wished for some method which would automatically clean the gutters in his dairy barn, but it remained for H. R. Kreider, Medina County, to do something about it and today he has a device which will clean the gutters in his barn perfectly in 2½ minutes, simply by the turn of a switch.

After almost three years of operating the device, Mr. Kreider thinks it a practical method of eliminating a heavy and disagreeable farm chore.

Not only does the machine remove the manure from the gutter, but it will load it into the spreader or place it in a pile on the outside of the barn just as desired. Another feature which Mr. Kreider likes is that straw or other bedding may be used and this is well mixed with the liquids, thus preventing their loss before reaching the fields.

Mr. Kreider says that he spent about 10 years planning some method which would relieve him from the half hour or more of hard work which was necessary each day in cleaning his dairy barn which holds about 16 cows.

Constructed almost three years ago of junk parts, the device worked well enough to demonstrate its value, so about a year and a half ago it was rebuilt entirely of new parts and has been in operation since that time.

A conveyor chain, much like that used in the bottom of a manure spreader, extends the full length of the gutter, up an incline outside the barn and around a wheel. The conveyor chain is fitted with flat cleats which extend across the bottom of the gutter.

Reprinted by permission from The Ohio Farmer

The gutter was especially constructed with a false bottom and tunnel underneath for the return of the conveyor chain. Power for running the conveyor is provided by a one-horse electric motor thru a speed reducer which gears the chain speed down almost 100 to one.

One of the chief construction difficulties was encountered in making the manure travel up the sloping trough from the end of the gutter to the height necessary to allow for loading into a spreader or placing in a pile. A large sprocket wheel designed by Mr. Kreider especially for the purpose finally solved the difficulty.

A number of devices have been invented for cleaning the gutters in barns, but most of these have provided only for taking care of manure without bedding and thus much of the valuable liquids was often wasted. An attractive sanitary appearance was often lost also.

As Mr. Kreider now has his barn equipped, he may return from town in his best suit on a cold winter afternoon, go to the barn where he throws a switch, and in 2½ minutes the gutters are cleaned. A thin layer of straw spread in the gutter over the conveyor chain when bedding down the stables, not only keeps the switches of the cows clean and dry but also wipes out all the moisture from the gutter when the conveyor is placed in operation.

Another advantage of the device pointed out by Mr. Kreider is the fact that liquids are not splashed over the floors and walls as is often the case when cleaning into a wheelbarrow.

Watch Stable Temperature

IF a dairy barn filled with cows is well built and well insulated and the ventilation is regulated to prevent drafts the animal heat will keep the stable warm enough for best production even in the coldest states and artificial heat is neither necessary nor desirable. Cows will do better at temperatures of 50 to 55 degrees than at 60 to 65, as they seem more comfortable, have better appetites and remain healthier than at higher temperatures.—*I. W. D., Ohio Farmer*

Methods Employed in Swine Breeding

Condensed from The Poland China Journal

W. H. Peters

Chief, Division of Animal Husbandry, University of Minnesota

SWINE breeding, as we know it and practice it today, had its beginning with the formation of the pure breeds. Our important breeds of swine, unlike most of our other pure breeds of livestock, had their origin in our own country. They were formed in the United States. They are American made. Of course, there had to be some kind of foundation stock for them; and since there were no hogs on the American continent when Columbus discovered it, the foundation stock for our breeds of hogs was imported, brought here from European countries, principally from England.

We also have three breeds of hogs that were already recognized as pure breeds in England before the foundation stock for them was imported to the United States. They are the Berkshire, Yorkshire, and Tamworth breeds. Little is known about the characteristics of these early hogs that were brought into America.

How, when, and where did our pure breeds of hogs originate? is a question that is given little thought by most breeders of purebred hogs today. I do not believe it is necessary for one to know a great deal about the early history of a breed of hogs in order to be a successful purebred breeder today. It will, however, be of interest for the purpose of this discussion to point out how the American pure breeds got started. They all originated in the same way. Back during the period from 1800 to 1850, large cities were developing in the eastern part of the United States. There began to be a demand for pork. Farmers found it profitable to raise hogs and sell them to the butchers.

At this time in certain communities in the East, where hogs had already been raised for a good many years, the hogs in the community, principally through natural selection and possibly some environmental influence, had begun to show some uniformity in color and body shade. As is always the case, in each of these communities there was at least one man, generally several men, who took more interest in their

Reprinted by permission from Poland China Journal

hogs than most of the farmers of the community; and in each case, these few men began keeping for breeding stock in their herds only animals of a uniform color, similar body form, and similar shape of head and ears.

That was the beginning of selection as applied to swine breeding in the United States. As a result of this selection, the hogs in the few original herds soon began to show improvement and especially greater uniformity than the average hogs of the community. The few early improvers in the case of each breed soon began to buy breeding stock from one another. Then the thing happened that led to the organizing of the record associations and the registering of hogs. Farmers from a distance began to hear about the improved hogs that were to be found in such and such a locality. Hogs that all looked alike, same color, same shape, same kind of head and ears, and hogs that grew faster and made better carcasses than the general run of hogs through the country. Hearing about these hogs, farmers from a distance began to go to these communities and buy breeding stock.

These early improvers began to have a prosperous business in selling hogs for breeding stock. It was only natural that about that time some of them began to see that, as the youngsters would put it in modern slang, "they had something there." They saw that if their hogs were going to retain their uniform distinguishing characteristics, they would have to be kept pure and their identity would have to be protected. To make a long story short, the solution of this problem was the organization of the record associations and the listing of the hogs belonging to the first members as foundation animals, after which no animals were accepted for registry except those descended from the accepted and registered foundation stock.

Through the association record, the marking of pigs for identification and the issuing of pedigrees, the swine record associations have done a pretty good job of preserving the improvements made by the early breeders who produced the foundation stock for the breeds.

We do know that purebred Chester White pigs of today do not look exactly like purebred Chester Whites of 75 years ago. Purebred Durocs do not look exactly like purebred Durocs of 50 years ago. Changes and improvements have been made within all of the breeds. What have been the methods used in bringing about these changes and improvements?

First: We have brought about marked changes and improve-

ments by selection. What is selection? Selection is picking out those hogs that in appearance most closely approach an ideal standard existing in the mind of the person doing the selecting. That is what a judge is doing when he places your hogs in the show ring. He is just trying, at least, to line them up in the order in which they come closest to the ideal imaginary picture he has in his mind of what a perfect hog of your breed ought to look like. That is what you are doing when you choose your breeding stock by selection.

Selection, as it has been practiced by our breeders of purebred hogs, and as it has been led by the standards established and taught by our swine shows, has been responsible for most of the improvement that has been made in the hog stock of the United States during the last 100 years. Of course, in breeding purebred hogs, there has been a very important limitation. This limitation of selection has been the purebred record association. If you are a breeder of Poland China hogs, for instance, you have to make your selections from hogs that are registered Poland Chinas. That has been a good thing. In fact, it is the one thing that has prevented the purebred breeder from losing his breed identity by introducing too many new characteristics into his herd, which he probably would do if he were privileged to select breeding stock from all of the hog stock of the country.

There are, however, several things we will all admit regarding our efforts to improve hogs by selection that are not as pleasing as they might be. First, it is a slow process. Changes and improvements come slowly, and we often find that a sire or a sow does not produce just the kind of pigs we had expected they would. Second, after many years we still do not have as high a degree of uniformity in our purebred hogs as we should like. The pigs in one Poland China herd, for instance, differ too much from the pigs in another Poland China herd. This is because the one breeder has an ideal in his mind as to what a Poland China pig ought to look like, and he has been selecting toward that ideal, while another breeder has a somewhat different ideal and has been selecting toward it.

It is true that breeders are generally agreed on the limiting breed characteristics, such as color, shape of head, carriage of ear, and the generally approved body type or shape. Breeders and judges at swine shows do differ materially, however, in their standards as to correct details of form, proper weight for age, and correct degree of refinement or quality. This is a situation about

which something could and should be done. For instance an annual conference might be held under the leadership of the officers of the record association. To this conference would be invited a list of men already experienced in showring judging, with any others who desire to do so, welcome to attend. At the conference each year the characteristics for the breed would be studied and instruction in judging given. Then, if the judges for all of the leading shows of the breed for the season were selected from the attendance, a more uniform job of judging for the country as a whole might be accomplished. This should lead to greater uniformity among our purebred hogs, and possibly to less criticism of the judging at our shows.

A second method or practice that has been used some in the breeding of purebred swine is inbreeding or the mating together of related animals. Some inbreeding was practiced in the formative period of practically all of our pure breeds of livestock. How much good it did or how much harm it did, no one really knows. We know that inbreeding has not contributed any new characteristics to any breed except in that it may have intensified and brought out some recessive characters that would never have been established in the breed without the inbreeding.

There has been less inbreeding practiced in the breeding of hogs than in some of our other types of livestock. We do not know enough as yet about the results of it to recommend it as a general practice to be followed by swine breeders.

The practice of inbreeding offers some possibilities as an aid to further improvement of hogs in the future; but it still remains for our leading breeders and the animal geneticists to determine how and when to use it and how to control it, so as to secure its advantages without its disadvantages. At the present time, dilute inbreeding, or linebreeding, as we call it, in practice seems safe enough and desirable; but, as a general practice, close inbreeding should be avoided.

A third method or practice that has been responsible for the production of some of our best purebred hogs has been the crossing of two linebred strains or families of hogs within the same breed. If this practice is successful, we say it is a "nick." That is, we have succeeded in combining the good points of two strains into one new strain possessing the good points of both.

The objection to recommending this as a desirable breeding method is that, theoretically, within a breed we should not have strains that differ widely in characteristics. Theoretically, all

strains should show the same characteristics and be uniform; and there should be no need for crossing of strains.

A fourth method or practice in breeding purebred hogs that has received a little attention and that should receive a great deal more in the immediate future is the supplementing of selection by performance records. Showring winnings at our state fairs and national livestock shows is one type of performance record. A record of the number of pigs farrowed and raised in a litter, the daily rate of gain, the feed consumption per 100 pounds gain, and the quality of carcass produced is another type of performance record. In selecting breeding stock, consideration should be given to both of these types of performance records whenever such records are available. Supervising these performance records, encouraging them, keeping a record of them and making them available in printed form to the breeders and to the public is a job for the secretaries of record associations.

The showring records can be made available at little cost, and for some breeds they are being made available now. Production performance records have played an important part in recent years in the breeding of race horses, dairy cattle, and chickens. To date, however, they have not been developed by any of the breeders of the meat animals, either beef cattle, sheep, or hogs, except that there are one or two breeders of purebred hogs who have been keeping and using production performance records of their own in selecting breeding stock to be retained in their own herds. I understand these production performance records have also helped them considerably in making sales.

Because of the larger number of pigs produced per litter, the short gestation period, and the early age at which they reach maturity, hogs offer the greatest opportunity of any of the types of meat animals for the use of performance records as an aid to selection for improvement. Swine breeders will find it profitable to become interested in production performance records and to cooperate in the development of any sound, practical record-of-performance plan that may be initiated by their record association.

So far, we have discussed only methods of breeding purebred hogs. The discussion has been limited to purebred breeding because, since the formation of the pure breeds, improvement in the hog stock of the country has been brought about entirely by first improving the pure breeds and then using sires of the pure breeds on the common hog stock

of the country. Registered purebred hogs comprise about 2 percent of the total hog stock of the country; but at least 98 percent of all the improvement that has been made in our hog stock through breeding has been accomplished first within the pure breeds and then transmitted by them to the rest of the hog stock. It is important that these breeds be kept pure. It is important that they be further improved. The United States Department of Agriculture and a number of state agricultural experiment stations are conducting experiments to try to learn how to secure further improvement and how to secure and maintain greater uniformity within the pure breeds. We have experimental work with the breeding purebred hogs under way at this experiment station. The object of this work is to try to find new breeding methods that will make the breeding of purebred hogs simpler and results a little more certain than they now are. This work has not been in progress long enough yet to have results to offer. It may be five years or ten years before we will learn anything new of value from it, or we may never get any new information that can be used to advantage from it. Nevertheless, you will be interested to know that the experiment stations are trying to secure information about the breeding of purebred hogs that will be of value to breeders.

There are many farmers who wish to raise hogs only for their pork value; men who do not care to keep the necessary records required in raising purebreds; men who do not care to give time to showing, advertising and selling breeding stock. How should such a farmer proceed? What breeding methods should he follow?

There are three breeding plans, any one of which the market hog raiser can follow with assurance of success, so far as his breeding results are concerned. First, he may start with a purebred herd and then go ahead using purebred boars of the same breed but need not bother about registering the pigs. Continuing in that way, he will always have a purebred but unregistered herd, which should retain the purebred uniformity and characteristics and be very suitable for the production of market pigs, but a herd from which he will not be able to sell breeding stock as purebreds.

Second, he may start with sows of common or mixed breeding and use a purebred boar on them. Then by continuing to use purebred boars of the same breed, he will be following the practice called grading up; and he will find this a very successful breeding plan for the production of market hogs.

Third, he may start with a group of purebred or high-grade sows and mate them to a boar of another breed, thus introducing the plan known as cross-breeding. He may continue the cross-breeding by alternating boars of the two breeds represented, or, if he chooses, he may introduce a boar of a third breed and then rotate the boars of the three breeds. This is a breeding plan for the production of market hogs that has been given a thorough experimental trial here at the Minnesota Experiment Station and found to be a satisfactory plan. It has two advantages. First, while the crossbred pigs generally lack uniformity of color, they are generally uniform in shape and rate of growth. Second, crossbred pigs generally possess greater vigor and will grow a little faster and make their gains on a little less feed than comparable purebreds.

In the practice of crossbreeding, it must always be kept in mind that the crossbred pig gets his hybrid vigor from his purebred ancestry, and if crossbreeding is not to degenerate into scrub breeding, one rule must be strictly adhered to. That is that every sire used must be a purebred sire of some breed. It must be remembered also that selection of a good boar and careful selection of the sows is just as important in crossbreeding as it is in breeding purebreds or grading up.

Cream Separators Needed

Richard C. Davids

Condensed from The Farmer

ONE of the factors that seems to have been overlooked in considering ways and means of dealing with the surplus of dairy products is more complete utilization of skimmilk and buttermilk on the farm. Within the past few years there was a scramble on the part of many creameries to install drying plants and farmers were encouraged to deliver whole milk, instead of separating and making use of the skimmilk at home. This, perhaps, worked to the advantage of the dairy farmer while prices for powered skimmilk and buttermilk were high, but the time came when production exceeded demand and today powders are piling up and hard to sell. This has helped to complicate the whole surplus problem.

If a reversal of this trend has not already set in, it is certainly in order. Skimmilk and buttermilk, which are practically equal in feed value, are among the best sources of protein. Hogs cannot be fed satisfactorily without a protein supplement. Skimmilk, properly fed, will furnish all the protein necessary in the hog fattening ration. In feeding trials recently reported by the University of Minnesota it was found that 100 pounds of skimmilk, when fed with wet rendered tankage, has a value equal to a half bushel of corn; and when fed with dry rendered tankage it has a value equal to a fourth bushel of corn.

These same trials, which also compared the value of skimmilk with tankage, showed that after a few weeks of feeding, skimmilk-fed hogs will do better if self-fed bone meal. When fed with corn, the skimmilk should be fed at the rate of three pounds to one pound of corn.

On a good many dairy farms no hogs at all are kept. One-crop farming whether it be grain or milk, is a dangerous practice. The single-crop dairymen would do well to consider a plan of keeping some hogs and retaining enough skimmilk on the farm to furnish the protein necessary to raise and fatten these hogs.

The net of the whole thing is that a separator is a mighty handy thing to have around and that in many cases it should be used more than it is.

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Growing Grass for the Seed

Condensed from Kansas Farmer

THE practice of reseeding the tall-growing native grasses of Kansas is growing steadily.

This interest in harvesting the seed of Bluestem, Switch and Indian grass, as well as Side Oats Grama and others, was climaxed for the year at the fall agronomy day at Manhattan in September, when several hundred farmers came from all over Eastern Kansas and looked at the grass seedings at the soil conservation service and department of agriculture nurseries.

They saw seedings of Big and Little Bluestem, Switch and Indian grass, seeded last spring and the year before. This grass was carefully handled and many plants had reached the height of one's head. The seed was covered about ½-inch deep and then 3 inches of pulverized soil placed on top. This was raked off after the seed had germinated. Under this system excellent growth was obtained and where small plots are desired, the same plan might be followed.

For reseeding areas on the farm, a plan which is recommended is to mow well seeded hay and scatter it over the bare spaces. Then run a disk over this to cut up the heads, throw some soil over them, and shell out the seed. Usually the disk should be run nearly straight. Other times, cattle grazing or wintering in a pasture will thresh out and cover the grass seed by their walking about.

Another recommended system of reseeding is to harvest the seed and broadcast or drill it in soil which has been prepared. It might as well be said that the method of preparing the soil and covering the seed is just as well left to one's good judgment. Disking is commonly suggested, as it leaves a cover on the ground and doesn't destroy all the growth already there.

Probably the most invulnerable rule that can be applied to seeding of native grasses, is to allow the new seedings to become well established before grazing. In calling on farmers over all of Kansas this year, it is evident that even pastures which seemed hopeless, had come back to a surprising state of productivity, particularly if they had been protected from grazing until late summer. Well established growth could be grazed early, but new plants which were coming from seed, the same as those which

one might plant with a drill, could not resist the shock of being nipped off by eager livestock.

Blue Grama grass, or Little Grama, found primarily in Western Kansas, has been seeded successfully at the Hays station by cutting the hay and scattering. It does not seem to germinate well or give good results if the seed is harvested and then scattered. When Blue Grama is allowed to grow up, it may be harvested readily as hay for seeding purposes, altho the forage yield would be low.

Our wild native grasses, being hot weather plants, have given best results if seeded in the spring and allowed to grow during the summer as they do in their natural state. Therefore, March or April seeding apparently is right.

Harvesting grass seed, principally Bluestem, has been done a number of ways, but the small combine is recommended by Donald R. Corneilius, of the Soil Conservation Service, from observations of farm experience. Strippers have been successful for the government work. A number of men have bound and threshed their seed with ordinary grain equipment.

Last fall Will Buss, Oxford, bound considerable Bluestem and threshed it. Then on a windy day, last March 18, he and his men broadcast it by hand from barrels set on a hayrack. They probably put about 20 pounds of good seed to the acre. There had been a fair stand of Sweet clover on the 20-acre field they seeded, and this came up well with the spring rains, choking the Bluestem back more than Mr. Buss realized.

He mowed the clover from 5 acres and got a fine stand of grass. It reached a height of 10 to 20 inches. Where the clover and weeds were allowed to grow, the grass stand is naturally thin.

An interesting thing is that the strong north wind carried some of the Bluestem seed over onto a barley field nearby, and now there is a good stand of Bluestem out into this barley stubble for about 10 yards.

Seed houses of the state have been swamped with inquiries for price quotations on Bluestem seed this year for the first time. Of course, there is no established price yet, as the whole idea is new, but we see in this development a new angle to farming, and no doubt in a few years, Bluestem seed will be a stable product.

Germination of native grass seed is low at harvest, but after being cleaned and held over the winter it should reach 70 to 80 per cent, which is reasonably high for this type of seed.

The hard dough stage is the time recommended by the college for harvesting Bluestem seed. This was near the time of the

frost which occurred in the Blue and Kaw river valleys in September.

An interesting report is made from Cowley county by Walter Daly, concerning Roy Vanskike, who back in 1926 gathered 40 pounds of Indian grass seed and scattered it on 3 acres of worn-out cultivated land. In 2 years he had a good stand. For a few years the Indian grass was cut for hay, and had spread over an additional 2 acres. The cattle now graze it along with Bluestem. Mr. Vanskike believes Indian grass will grow on land which will not support Bluestem and that the seed is easier to harvest.

Soil Loss

About forty years ago, a farmer hired a man to plow a ditch several miles long to drain some low land in a southern California county, paying him sixteen dollars to do the job. This double plow furrow, known locally as the "sixteen-dollar ditch," is now sixty feet deep and two hundred feet wide.

Carrots in Silage

Putting carrots in corn silage helps New Jersey dairymen produce milk with more color and provides a new use for carrots.

Square Shoulders in Seed Corn

Condensed from The Indiana Farmer's Guide

Dr. C. T. Gregory
Purdue University

SQUARE shoulders are usually associated with rugged health and an aggressive nature. What is true of men happens to be also true of seed corn but in the corn we have reference to the square shoulders of the tip of the kernel. Such kernels are fully finished and are packed with an abundance of food about the embryo. Such kernels have been fully ripened and matured by the plant, on the ear. Square shoulders and full maturity of the kernel tips is what every corn grower should look for in his seed if he wants the best. This is what we call No. 1 seed corn. One reason for all this is that the kernel of corn matures from cap to tip. In other words, as the kernels ripen on the ear, the last part of the kernel to receive the finishing touches by the plant is the tip. If, for some reason, the plant can not quite finish its job, the tip of the kernel will be filled with light-colored, soft starch and will frequently be more or less tapered. Such corn was not fully adapted to the soil and climatic conditions on the farm. The aim of every corn grower is to find corn that best fits his farm. Discarding the No. 2 quality is one step of accomplishing this. That is one reason. Another one has to do with the health of the plant. Experiments have repeatedly shown that when a fungus gets into the ear of corn, either through the tip or the shank, it spreads through the cob and into the kernels through the tip. Now, when these fungi enter the kernel tip they cause various kinds of discolorations. Sometimes the color is pink. Sometimes it is reddish brown and in some cases there are whitish streaks extending up the face of the kernels. One fungus leaves the kernel tips black. Sometimes a white mold is visible in the kernels close to the cob but more often there is no such visible evidence of the presence of the fungus. The well-matured, square shouldered kernel never shows signs of immaturity. It is filled with hard, well-matured starch from cap to tip. Fungi are unable to penetrate this well-ma-

Reprinted from The Indiana Farmer's Guide, Huntingdon, Indiana

tured kernel tip so that such maturity is an excellent insurance against disease.

Every farmer can take advantage of these facts by culling his seed corn. There is nothing difficult about the process. It is not necessary that the farmer know which kind of fungus caused the trouble. It is only essential that he know that his seed corn has not been killed or weakened by freezing. Anyone can determine this by extracting two or more kernels from about 100 ears picked at random and germinating this sample of kernels. If 90 per cent or more of them grow, the ears will be suitable to cull.

Shell each ear by hand into a pan and examine the kernels for signs of immaturity and disease. Look at the tips of the kernels, particularly. If the tips are immature, light in color or discolored and are pointed rather than square shouldered, discard the whole pan of seed. Accept only seed that is fully matured and shows no signs of disease or immaturity at the tip. Most farmers will do a lot of discarding before the ears are shelled. They know that the light-weight ears and those on which the kernels are loose will never do for seed purposes. They also know that the ears showing discolored or shredded tissues at the butt of the ear are likewise undesirable. All such corn never gets into the planter box.

During the past two years, we have been culling seed corn for about 40 Indiana farmers. In each case, this corn was shelled by hand and then shown to the farmer so that he might decide if in his opinion it was suitable for seed. Out of this corn the farmer accepted as suitable for seed, the No. 1 and No. 2 grades were selected by examining for maturity and presence of disease. By this means, we obtained what was termed No. 1 grade, the well-matured, healthy-appearing seed, and No. 2 the less well-matured seed with poorly finished tips. The farmer planted these two grades in adjacent plots and yield estimates were made in October or November.

We have learned some interesting things from these tests. In the first place, the No. 1 grade of seed has outyielded the poorer grade from 3 to 4 bushels per acre. We have also found that the corn of a farmer who has been selecting only the best-matured types of corn during the past few years did not show this difference. The indications are that 75 per cent or more of the farmers will profit by careful culling of their seed.

Bottle-Fed Calves

Condensed from Successful Farming

CARL Francisco, of Edna, Kansas, believes he has solved his calf-feeding problems and also found a further use for old, rubber teat-cup inflations from milking machines. Manager of the largest Jersey herd in Kansas, at Windmoor Farm, his experience is worth noting. Pail feeding has been discontinued at this farm within the past year, and all calves are now bottle fed. An ordinary 24-ounce soda or ginger-ale bottle is used, with the teat-cup inflation pulled on over the neck of the bottle and serving as a nipple. The milk is fed 3 times daily, and at feeding time the bottle is simply inverted in a rack and the calf does the rest.

Bottle feeding was started in the fall of 1937 after considerable trouble with pneumonia and scours. They have found bottle calves easier to raise than bucket feds, and where proper care is taken with sanitation and milk temperatures, digestive troubles have been eliminated almost entirely. Particular stress is laid on cleanliness. The bottles and nipples are washed immediately after use. This is followed by disinfection in either a chlorine or lye solution, where they are left until the next feeding.

In spite of the fact that most calves are reared that way, Nature did not intend the calf to gulp its milk hurriedly from a pail. When nursing, the milk is drunk slowly, and much of the benefit from bottle feeding is due to this fact. As a result most of the milk is conveyed to the true stomach and digested. In the pail-feeding method the milk is drunk so rapidly that much of it is forced into the paunch and often causes the calf to have serious digestive troubles.

At Windmoor Farm they have raised between 75 and 80 calves by the bottle method—as thrifty a lot as you would want to see. Briefly, this is their feeding schedule: The calf is left with its dam for the first 24 to 36 hours. It is then fed by bottle until weaning at about 30 days of age. Two ounces of lime water are provided at each feeding; also a tablespoonful of cod-liver oil daily. As soon as the calf can be induced to eat, it is started on pellet-form calf meal. This is limited to 1 pound daily and is fed in conjunction with a simple, homemade grain mixture. A good grade of prairie hay furnishes all the roughage that is needed.—*W. H. R.*

Transplanting Trees When in Leaf

IT has always been a comparatively simple matter to transplant most deciduous trees when in a dormant state, but the transplanting of such trees when in full leaf has been a problem which has been fraught with difficulties. A wax emulsion spray has recently been perfected which, in time, will probably revolutionize some nursery practices, as it makes possible the moving of fairly large trees when in full leaf with a remarkable degree of success.

After many experiments, beginning in 1932, Dr. E. J. Miller and his colleagues, at the Michigan State Experiment Station, have succeeded in perfecting an emulsified wax which is capable of being dissolved in water. It can therefore be sprayed over the entire tree, so that not only the trunk but the whole tree is covered with a thin film of wax which is flexible, colorless and lasting. While the wax retards evaporation, it does not completely arrest transpiration. It can be applied to large trees with a power sprayer, or to small trees and bushes by a hand sprayer. So satisfactory are the results that when this method is used on deciduous stock in a dormant state, pruning is not always necessary, and it makes a far better bark protection than wrapping the trunk with burlap.

When transplanting deciduous trees in full leaf the entire plant should be sprayed with wax in order to cover both the upper and under leaf surface. In July, 1934, when temperatures ranged around 90 to 95 degrees, a nursery transplanted 22 Moline Elms, 11 of which were sprayed with wax and 11 of which were untreated. Of the 11 wax-sprayed trees, only one died, while of the 11 untreated trees only 1 survived transplanting.

In transplanting evergreen trees the spraying of wax emulsion before digging and again after setting is an enormous help in retarding evaporation, and, in the case of some of the more rapidly growing evergreens, such as the Norway spruce, it may well obviate the necessity of lifting the tree with a ball of earth, the method heretofore considered essential in handling evergreens.

If a tree has been transplanted from the woods to a sunny position, it is likely to suffer somewhat from sudden exposure to the sun, and from too rapid evaporation. Such a condition may be obviated by the use of a wax emulsion spray.

For deciduous stock one application of the spray is usually

sufficient. The spray should be applied when the outside temperature is at least 45 degrees F. or warmer, as it does not spread well in cold weather, and is therefore not as effective.

Wax sprays have been used successfully for the preservation of fruits and vegetables for the market, to retard the wilting of cut flowers, and for similar purposes in many other horticultural processes, but its use as a protection for trees at the time of transplanting is quite recent. As this new method becomes more widely used it will make radical changes in planting programs, prolonging the planting season into late spring and commencing it earlier in the autumn, and either reducing the severity of pruning, or eliminating it altogether.—*J. B. B.*

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INDEX

Beef Cattle

Creep-Feeding Calves ..... Jan., 1938
Cow Herds Make the Forage Market ..... March, 1938
Herd Production Costs ..... March, 1938
Fattening Calves on Milo Grain .. March, 1938
Beef without Grain ..... April, 1938
Fattening Cattle on Pasture ..... July, 1938
Ranching, 1938 Style ..... Sept., 1938
Making Beef with Ayrshire Steers .. Oct., 1938
Calves Prefer Oats ..... Oct., 1938
Care of the Herd Bull ..... Nov., 1938
Limestone Feeding ..... Nov., 1938
Application of Breeding Laws ..... Dec., 1938
Importance of Breeding Matrons ... Jan., 1939

Conservation

Soil Conservation Service ..... Feb., 1938
The Menacing Morning Glory .... March, 1938
Pioneer in Conservation ..... July, 1938
Perpetuation of Wild Life ..... Nov., 1938
What Has Happened to the Shelter Belt, Dec., 1938
A United Front to Reclaim the Dust Bowl, Dec., 1938
Terraces Increase Yields ..... Jan., 1939

Crops

A Creeping Alfalfa ..... Jan., 1938
Damping Off of Cotton ..... Jan., 1938
Crotalaria is Good for Southern Soils Feb., 1938
A Grass that Fattens ..... Feb., 1938
Forage Crop Engineering ..... March, 1938
Repeat Profit ..... March, 1938
Our Old Friend Timothy ..... March, 1938
Rare Crops ..... March, 1938
Danger of Unadapted Clover Seed .. April, 1938
An Adventure in Grass Farming .. April, 1938
When There's a Snake in Sudan Grass, July, 1938
Barley's Future ..... May, 1938
Increasing Protein Content of Timothy, June, 1938
Handling Hybrid Seed Corn ..... June, 1938
Hayways ..... July, 1938
Certified Grimm Alfalfa ..... Sept., 1938
History of Hay Making ..... Oct., 1938
Seed Treatment for Small Grains .. Nov., 1938
Permanent Clovers ..... Nov., 1938
Artificial Drying of Roughage ..... Nov., 1938
Story of Yorkwin Wheat ..... Nov., 1938
Made-to-Order Corn ..... Nov., 1938
Nutrients, Not Tons per Acre ..... Nov., 1938
When Wheat Follows Soybeans ..... Nov., 1938
Streamlining a Rotation ..... Nov., 1938
Clover Farmer ..... Dec., 1938
Flax as a Gulf Crop ..... Dec., 1938
Winter Barley ..... Dec., 1938
Innoculation for Legumes ..... Dec., 1938
When Buying Hybrid Corn ..... Dec., 1938
Good Crop for Low Land ..... Dec., 1938
Birdsfoot Trefoil ..... Dec., 1938
New Blight-Resistant Milo ..... Jan., 1939
Sea Island Cotton ..... Feb., 1939

Dairy Cattle

Calf Feeding ..... Jan., 1938
Iodine Feeding ..... Jan., 1938
Raising Dairy Calves ..... Feb., 1938
Index Ghosts ..... March, 1938
Genes, the Basis of Breeding .... March, 1938
Production Records ..... April, 1938
Do High Testing Cows Produce More Fat? May, 1938
New Treatment for Mastitis ..... May, 1938
Danish Dairying ..... June, 1938
Plan for Livestock Improvement ... June, 1938
High or Low Pressure Dairying ... June, 1938
Feeding Experiments ..... July, 1938
Artificial Breeding Society ..... July, 1938
Why Cows Leave Home ..... Sept., 1938
Breeding Dairy Cattle ..... Sept., 1938
Way to Stop Milk Flow ..... Oct., 1938
What Happens to Herd Sires ..... Oct., 1938
Dairy Experiments ..... Oct., 1938
Minerals for Dairy Cattle ..... Nov., 1938
Why Some Calves Die Young ..... Nov., 1938
Artificial Insemination Progress ... Dec., 1938
She Lost Two Quarters, But ..... Jan., 1939
Improving the Curd Size of Milk .. Jan., 1939
Milking Shorthorn Cow ..... Jan., 1939
Bang's Disease ..... Jan., 1939
Blood Transfusions for Calves ..... Feb., 1939
Brown Swiss Cattle ..... Feb., 1939
Taking the Bull Visiting ..... Feb., 1939
Calf Raising Problems ..... Feb., 1939
Trim Your Bull's Feet ..... Feb., 1939

Farm Machinery

Winter Gas Engine Troubles ..... Feb., 1938
Tractor Costs Then and Now ..... Feb., 1938
Tractor Care ..... May, 1938
Types of Pumps for Farm Use .... July, 1938
Hay Choppers ..... Sept., 1938
Lubricating Oil ..... Oct., 1938
Increasing the Farm Water Supply . Oct., 1938
History of Farm Implements ..... Nov., 1938
The Combine Harvester ..... Jan., 1939
Short Cut in Liming ..... Jan., 1939
Anti-Freeze for Tractor Tires ..... Feb., 1939

Fruit

Apple Scab Can Be Controlled ..... Jan., 1938
Re-evaluating the Dwarf Fruit Tree Feb., 1938
Pollination of Fruit Trees ..... March, 1938
Peach Mosaic ..... March, 1938
The Man Behind the Spray Gun .. April, 1938
Raspberry Varieties ..... April, 1938
New Manchu Apricots ..... May, 1938
Alternate Bearing ..... May, 1938
New Varieties of Tree Fruits ..... June, 1938
New Aspects of Fertilization ..... June, 1938
Orchard Irrigation ..... July, 1938
Raising Quality Fruit ..... Sept., 1938
How to Grow Bush Fruits ..... Oct., 1938
Late Keeping Grapes ..... Oct., 1938
Too Many Bruised Apples ..... Oct., 1938
Peach Progress ..... Nov., 1938
Use of Peat Moss in Planting Trees . Dec., 1938
Incubator Fruit Trees ..... Dec., 1938
Citron Being Produced ..... Dec., 1938
Cover Crop for Orchards ..... Jan., 1939
Profitable Pruning ..... Feb., 1938
Dwarf Fruit Trees ..... Feb., 1938

Fertilizers

Fertilizer Analysis ..... March, 1938
Mixing Your Own Fertilizers ..... April, 1938
Fertilizer Placement ..... May, 1938
Fertility Loss Must Be Figured ... May, 1938
Small Tonics Increase Yields ..... June, 1938
Phosphatic Fertilizers ..... July, 1938
Fertilizers for the Dairy Farm ..... July, 1938
Drilling Fertilizer ..... Sept., 1938
What Are Fertilizers? ..... Sept., 1938

INDEX

...and Fertilizers ..... Sept., 1938
...Soil's Limiting Factors ..... Oct., 1938
...Fertilizer Action and Plant Nutrition, Oct., 1938
...ctions of Organic Matter ..... Oct., 1938
...ere to Place Fertilizers ..... Jan., 1939
...ron Deficiency Becomes a Problem Jan., 1939
...ep Manure Piles Wet ..... Jan., 1939
...duction of Artificial Manures ... Jan., 1939
...anced Plant Nutrition ..... Feb., 1939

...re-farrowing Management ..... March, 1938
...adies in Hog Type ..... April, 1938
...me Sanitation Plan ..... April, 1938
...g Yardstick ..... May, 1938
...Inbreeding Best ..... May, 1938
...e Pig Wants to be a Runt ..... June, 1938
...ers, Pasture and Protein ..... July, 1938
...Thrifty Pigs ..... Sept., 1938
...ork-Makers ..... Oct., 1938
...con for Breakfast ..... Nov., 1938
...elling on Carcass Grade ..... Dec., 1938
...eeding and Fattening Hogs ..... Jan., 1939
...ew Hog Method ..... Feb., 1939
...otein Supplements ..... Feb., 1939
...ther System of Pig Breeding .... Feb., 1939

...ses
...Dread Horse Disease ..... April, 1938
...inerals and Good Horses ..... July, 1938

...tures
...tensive Pasture Management .... Feb., 1938
...eding Permanent Pastures .... March, 1938
...proving Depleted Ranges ..... April, 1938
...sture Improvement ..... May, 1938
...w Models in Pasture Plants ..... May, 1938
...nger Grazing Seasons ..... June, 1938
...ttering the Range ..... Sept., 1938
...thrax ..... Nov., 1938
...-Products Profits ..... Dec., 1938
...ers Violet Lamps for Poultry ... Dec., 1938
...ep Your Litter Dry ..... Dec., 1938

...ry
...cubation the Crucial Period ..... Jan., 1938
...rich Winter Egg Yields ..... Jan., 1938
...ening for Better Profits ..... Jan., 1938
...all We Heat the Laying House .. Feb., 1938
...esh Air in the Incubator ..... March, 1938
...oducing Market Eggs ..... April, 1938
...ey Turkey Disease ..... April, 1938
...atteries vs. Range System ..... May, 1938
...ternal Quality of Eggs ..... May, 1938
These Frozen Eggs ..... May, 1938
Battery Brooding ..... June, 1938
Individuality Among Hens ..... June, 1938
It Pays to Insulate ..... June, 1938
Milk Increases Turkey Profits ..... June, 1938
Manganese Prevents Slipped Tendons, July, 1938
Ventilation for Poultry Houses .... July, 1938
Culling Cuts Costs ..... Sept., 1938
Is Chick Sexing a Luxury ..... Sept., 1938
Stop Coccidiosis ..... Sept., 1938
White Oak Quail Farm ..... Oct., 1938
Progress in Poultry Feeding ..... Oct., 1938
Artificial Lights for Poultry ..... Oct., 1938
Why Do Chickens Lay Such Eggs .. Nov., 1938
At the Finish ..... Nov., 1938
Eggs and Vitamins ..... Nov., 1938
No Monopoly on New Ideas ..... Nov., 1938
Profits from Smoked Turkeys ..... Jan., 1939
Crossbreds Win Acceptance ..... Jan., 1939
More and Better Poults per Breeder . Jan., 1939
How Thick Whites Get That Way .. Feb., 1939
Heredity and Environment ..... Feb., 1939
Influence of the Hatching Date .... Feb., 1939
Turkey Incubation Goes Commercial . Feb., 1939

Sheep

Cornbelt Sheep ..... March, 1938
Wool ..... April, 1938
Sheep Scab Mite ..... July, 1938
Protect Your Sheep ..... Sept., 1938
Make Lambs Market Toppers ..... Oct., 1938
Feeding and Breeding for Market .. Nov., 1938
Sweet Potatoes for Sheep ..... Dec., 1938
An Investment in Lamb Production . Dec., 1938
More Pounds of Wool per Ewe .... Jan., 1939

Silage

Straw Silos ..... Feb., 1938
Grass Legume Silage ..... July, 1938
Construction of Trench Silos ..... Sept., 1938

Vegetables

Conn. Straightneck Squash ..... April, 1938
Tricks in Veg. Breeders Trade ... April, 1938
Growing Trellis Tomatoes ..... May, 1938
Know Your Spinach ..... May, 1938
Nutritional Requirements of the Tomato, July, 1938
Battling Garden Bugs ..... Sept., 1938
Wax Keeps Vegetables Fresh ..... Jan., 1939
Certified Seed Potatoes ..... Feb., 1939

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